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CATTLE POISONING IN INDIA.

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IN Section XVI. of the Act proposed for the suppression of Cattle Plague in India, which was published in the VETERINARY JOURNAL for the month of March last, it will be noticed that it is laid down, that previous to burial the hide of any animal that has died during the prevalence of an outbreak of this disease is to be slashed. This was deemed necessary to guard against the chumars or leather-curers, who in this country are frequently professional poisoners, or, if not the actual perpetrators, are at least the instigators of the crime. In this country there is no Act to regulate the sale of poisons, and arsenic being used by these men in their trade, is always ready at hand to enable them to carry on their nefarious practices. The more animals that die the cheaper is the rate of hides; and, in fact, frequently these men receive the hides on condition that they will remove the carcases. If, therefore, all the skins were extensively slashed during the prevalence of an epizoötic, poisoning would be speedily arrested.

Much more attention is now being paid to Cattle Poisoning than formerly, for whereas in 1861 only five cases were scientifically proved in this province, the Punjab, in 1881, 169 cases were detected. The chemical examiner, with reference to this improvement, justly remarks:—"A successful inquiry into a few cases teaches all the farmers in the neighbourhood the methods used by the chumars, and they are put on their guard against

them. It also demonstrates to the members of the caste in the district that their secrets are no longer such, and that they are liable to certain discovery.

During the years 1879-81, 890 cases of suspected poisoning were referred to the chemical examiner of the Punjab, and in 471 cases poison was found. The reason that a number of cases remained undetected was that a subcutaneous method is frequently adopted, and the police-officers did not send the punctured portion of the hide, and of course no poison could be detected in the stomach, which was the part sent.

The chemical examiner, in his report for the year 1880, further remarks:—"Whenever cattle disease is reported prevalent in any particular district, it is observed that the number of references to this office increases." This would go far to prove that the cattle-poisoners take advantage of an outbreak of disease to increase their harvest. The methods adopted by these men are many, but, generally speaking, may be said to comprise—

1st. Administration of arsenic, which is one of the most common methods.

2nd. Subcutaneous poisoning, either by datura or ratti seeds (*Alrus precatorius*).

3rd. Mechanical—by the introduction of poison by means of a stick about one and a half feet in length either into the rectum or vagina.

There are other and ruder methods adopted, but the above three may be said to be the most common.

1st. Arsenical poisoning. White arsenic is generally given in dough, but also frequently by being put into the head of Indian corn, the hole which is made being closed up with dough.

2nd. Subcutaneous poisoning. In the Punjab ratti seeds appear to be used to make up the paste, but datura alba is also used in this province, and more extensively in other parts of the country; these latter seeds are difficult to powder; in order, therefore, to make them up these professional poisoners first roast them.

Either of the above agents are made up into small, conical-shaped pencils, about two inches in length and about one-fifth of an inch in diameter; at the base they are finely pointed; some-

times they are forcibly thrust into the skin over the loins, generally one on each side, but this practice often necessitates two or more attempts, which renders detection easier; the more advanced poisoners, therefore, first make a small incision, into which they place the "sui"—a needle. Soon after this is done, a slight swelling around the part appears, which gradually extends; the pulse is small and quick; the animal shows a reluctance to lie down; is very dull, and off its feed; shows great stiffness in the hind extremities; the mucous membranes are highly injected; these symptoms are frequently accompanied by a discharge from the eyes and nostrils. It will readily be understood how, at times, these symptoms can be mistaken by non-professional men for anthracoid disease, which is so frequently met with in India. The *post-mortem* examination will only show great effusion into the subcutaneous areolar tissue. This effusion is generally of a greyish colour, although at times it will be found to be nearly black. The brain and spinal cord will be found to be congested; the abdominal viscera will generally be found to be healthy, but the lungs will be congested. In all cases carefully inspect the hide to see if there are any incisions. This will be still more apparent after its removal.

The third and mechanical method adopted is that of using a stick about one and a half feet in length, which is generally notched at the end, so as to facilitate the adhesion of the poison used. In these cases ratti seed is resorted to; but aconite, croton seeds, datura, and arsenic are also frequently employed. These sticks are forcibly thrust up the rectum, penetrating this intestine, or up the vagina. They have, however, been occasionally known to have been thrust into the mouth. Death in these cases is not usually very rapid, but may be said to be caused by peritonitis or by suffocation, due to the diffuse inflammation set up in the throat.

When subcutaneous poisoning has been adopted, if speedily detected previous to the "sui" or needle having softened, relief can be afforded by making a free incision over the part, extracting the poison, and washing out the wound. In one case reported, this was done six hours after the needle had been inserted, and the patient recovered.

In case of datura poisoning, the natives have a recipe of their own, which is said to act well; the most important agent being the juice extracted from guiana grass—a grass known by the natives as an antidote for poisoning in general.

To determine whether animals have been poisoned by arsenic is, as a rule, a matter of no difficulty, owing to the large quantities generally given. Both kinds are used, either the white or teroxide, and the yellow or tersulphide—the former, however, being much more frequently resorted to.

There are no chemical tests by which datura or ratti-seeds can be detected. If used in paste, the evidence of the punctures, together with the history of the case, will enable us to give the necessary evidence; but when administered internally, they are given whole, or nearly so, and the fragments of the seed will be sufficient to guide us. The datura-seed can be mistaken for the capsicum, but the latter is of a bright yellow colour, whilst the datura is of a greyish-white. It is also thicker, and is grooved on the edge, whilst the capsicum is much thinner, and its edge is rounded. Another method adopted by these pests of society, who, for the trifling value of a few hides, will bring ruin on many a small farmer, is that of conveying the virus during the prevalence of an epizoötic outbreak from an affected to a non-affected centre. That this is done frequently I have no doubt. The only method by which these nefarious practices can be stopped will be by educating the farmers, and this can only be done when our department is much strengthened in India.

The above few remarks will tend to show the necessity which exists to bring the knowledge of veterinary science to the aid of the agriculturists of this country, and it is to be hoped that Government will not long delay the employment of many more members of our profession than are at present in the country.

"FILARIA OCULI" (WORM IN THE EYE) IN THE HORSE.

BY SURGEON-GENERAL C. A. FRANCIS, M.B.

IT was at one time considered in India, and there are some who still entertain the opinion, that there is a constant connection

between "Filaria Oculi" (worm in the eye) in the horse and his "going in the loins." In the single instance of the disorder that has come under my observation this connection did not exist; and I have reason to believe that the two conditions, where they do occur together, are accidentally concomitant. The operation of removing the worm has also been characterized as difficult, the preliminary step of "casting" being insisted upon as a *sine quâ non*. Neither in this does my experience bear out the general opinion, for I found the operation particularly easy.

My native groom one morning brought to the house for my inspection one of the stud-bred mares that seemed, he said, to have a cold in the eye. I thought so, too, and prescribed some mild alum lotion. The idea of Filaria did not then occur to me. No improvement taking place after two or three days' treatment, I examined the eye more carefully; and there, sure enough, was a worm-like little body swimming vigorously in the anterior chamber.

In the presence of my friend Surgeon Mitchell, of the 96th Regiment, I proceeded to remove it. Well in front of the mare —a quiet, sweet-tempered animal—was placed a supply of juicy fresh grass, whilst the groom kept feeding her with some more of the same. She was thus brought into a calm, quiescent state, suitable for the operation. Intent upon her present enjoyment, and in the prospect of its being continued, the mare kept her eyes well open. Stroking her head from the nostrils upwards with the ring and little finger of the right hand, I gradually got the lancet (a common bleeding one, held between the index finger and thumb) on a level with the eye; and, avoiding the central line of vision, I quickly and slantingly introduced it into the cornea in front of its union with the sclerotic. Most foolishly I had omitted to place a cup ready to catch the fluid that flowed out. Falling upon irregular ground it was useless to attempt to look for the worm, which was consequently lost. The mare went on feeding quite undisturbed, after the first minute or two, by the operation. She was then taken back to her stall, no further treatment being adopted beyond keeping the eye bandaged. In a fortnight she was at her work again.

INCONTINENCE OF URINE IN A COW, OF TRAUMATIC ORIGIN.

BY CHARLES COWIE, STUDENT OF THE ROYAL (DICK'S) VETERINARY COLLEGE, EDINBURGH.

THIS case occurred in the practice of my preceptor—Mr. Macgillivray, of Banff. On the 18th of August last we were called to see a short-horned cow, belonging to Mr. Watt, Lint Mill, Boyne, which he informed us had been suffering from a constant dribbling away of urine ever since her last œstrum, which occurred about seven weeks previously. She then had been served several times by the bull while grazing, and to this cause Mr. Watt attributed the condition of his cow—viz., that she had been hurt by the bull. On our first visit, while standing in the byre, we observed her pass small quantities of urine of a clear watery consistency, at intervals of about a minute. Not having a vaginal speculum with us that day, we simply separated the lips of the vulva with our fingers, and observed a little inflammation of the mucous membrane, which we attributed to the constant irritation of the urine. On our next visit, which, owing to pressure of business, was not until the 1st of September, we found the cow falling off in condition. She had ceased giving milk, and was not eating so well; there was the constant dribbling away of urine as formerly. We introduced a lithotomy sound into her bladder, with the object of detecting a calculus, but did not find anything. We next examined the meatus urinarius by the aid of a speculum, and observed a tear at the bottom of the fossa, immediately below the opening of the meatus, which we considered must have been done maliciously by some one, or that it had been done by the bull's penis having caught in the fossa and forced its way into the bladder during the act of copulation. On asking the owner if he thought that any one could have done it maliciously with a stick, he considered it highly improbable. Seeing that she had been running at large with the bull during œstrum, and that it occurred at that time, we can come to no other conclusion than that the bull had been the cause of it. Under the circumstances, we did not consider it of much use to proceed with any treatment, except the applica-

tion of an emollient to lubricate the passage, which was rather more inflamed than on our previous visit, but advised the owner to try if she would feed, and if not to get her slaughtered as soon as possible. The owner did not find her to get on well, and got her slaughtered, and kindly sent us, at our request, for *post-mortem* examination, her uterus, bladder, urethra, vagina, and vulva intact.

Examination.—We found the tear to be about three quarters of an inch in diameter; its edges had become callous, and communicated with the urethra and bladder; the latter was greatly diminished in size. On cutting into it, we found its walls enormously thickened and its capacity greatly diminished, which might be accounted for by its never being distended with urine, the latter passing off as it was secreted, or nearly so. It contained no urine, but had a mucoid deposit. The sphincter vesicæ was completely relaxed. The os uteri contained a plug of thickened mucus, and the uterus a fœtus, which had the appearance of being about eight weeks old. The extreme rarity of such a lesion occurring in veterinary practice, has prompted me to bring it before the profession.

CASE OF TETANUS AND ONE OF THROMBOSIS.

BY W. R. DAVIS, M.R.C.V.S., DOUGLAS, ISLE OF MAN.

ON Monday, August 27th, I was requested by Mr. Quayle, of Ballamoar, to go with him to his farm, twelve miles away, to see a valuable cart-mare, ten years old. I gathered from him that on the Saturday previous she had been ridden two miles to the smithy and shod, and turned out in a field with the rest of the horses at night. On this Monday morning she was noticed to be stiff, and sweating much when moved about. She had had a wound a few weeks previous, but it was now healed. A neighbouring quack was called in, but the proprietor not being satisfied, came for me. I thought it was, perhaps, a case of Tetanus, so took a set of slings and some medicine and went with the owner. On arriving we found that the farrier had gone, after ordering the mare to be walked about and kept on her legs; this had been done as long as practicable (during two hours or more), when

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she was put in a loose box, where she fell, and where she was now lying on the off side, her body rigid, wet with sweat, and steaming like a sacrifice; her near hind leg was poised in the air. At intervals of a few minutes dreadful clonic spasms took place, when she sometimes seemed as though she would kick the place down. Her teeth were firmly fixed, and during the spasms the membrana nictitans, which was kept protruded, went right across the eye. Her pulse was forty-four, large, and the artery full, respirations thirty and sonorous, temperature 106.° I told the owner that the case was a hopeless one, and that it was useless to attempt slinging her. Injections were given and much fæces removed, and I gave two drams of Acid Hydrocyanic, dil. P.B., and ordered one dram every hour afterwards (it was poured inside the cheek, and she managed to swallow it). I left at 4 p.m., and went by the first train on Tuesday morning to find that she had died a few hours after my departure in dreadful agony. As I never heard of a case terminating so quickly, my impression was that the exercise given to the mare, because she was thought to be suffering from Colic, must have hastened the fatal termination.

Thrombosis.

Tuesday, September 4th, 11.30 p.m., called to see a twelve-year-old hack-mare, the property of a car-owner. She had been to Port Erin and Castletown, a distance of twenty-eight miles, but had been purging on the road, and refused her food. She was lying, and we got her up with some difficulty. The artery was small and distinct, but no trace of a pulse could be detected; heart sounds all confusion—a churning sound; ears and legs cold, mucous membrane scarlet; mouth very cold, temp. 101°.

The purging had ceased, but abundant flatus escaped by the anus. I came to the conclusion that the mare was dying from heart-disease, and told the proprietor so. I gave strong stimulant (Sp. Nitr. and Chloric Aether), and wrapped the legs in straw ropes; for a time she appeared a little easier, but about 2.30 a.m., respiration, which was always difficult, became very laboured; she struggled violently and hung back on the halter; her head was loosed, when she toppled over, struggled for a time, and died.

Post-mortem next day: lungs showed some old pleuritic ad-

hesions, and emphysematous anus. Right heart dilated, and walls thin. A huge thrombus, organised and white, and weighing about four ounces, was attached to the tricuspid valve; the chordæ tendina passed right through it. It extended from the ventricle, where it was broad and expanded, into the auricle; here it divided into two branches, one lying in the anterior, the other in the posterior cava.

The abdominal viscera were healthy, with the exception of the liver, which was much enlarged and sclerotic. The organ was exceedingly tense, and Glisson's capsule so much on the stretch that on pressure with the fingers the liver felt like an air cushion. On section, the cut surface was almost bloodless, mottled, and felt gritty when scraped. The condition of this viscus is, no doubt, accounted for by the presence of the thrombus, which would induce congestion of the liver, its interference with the function of the tricuspid valve causing regurgitation into the right auricle and venæ cavæ, thus preventing the proper emptying of the hepatic veins.

A curious symptom I forgot to mention was great difficulty —in fact, almost inability—to swallow.

THE INFLUENCE OF HEREDITY AND CONTAGION ON THE PROPAGATION OF TUBERCULOSIS.

(*Continued from page* 176.)

OUR anatomo-pathological knowledge of this disease offers fewer *lacunæ* than do our means of diagnosis, properly so-called. The necroscopic lesions that are most frequently met with on opening the bodies of animals which, during life, were affected with the malady, and especially when these lesions are localised on the serous membranes, are neoplasms of the costal and peritoneal pleuræ, with their consequences. These neoplasms are in various forms. Their volume is from that of a millet-seed to that of a pea. They are present singly, or are united in grape-like masses; they are pedunculated, or have the form of a polypus, and sometimes even that of a wart; they are reddish-coloured, like flesh, or have a yellowish-brown tint; their consistence is

variable. Frequently the centre of the soft nodosities is deep red, while in the hard neoplasms the central portion is yellow and caseous, or has the consistency of mortar. According to Virchow, the tubercle neoplasms appear first in the form of little nodosities or "pearls," united into groups or clusters like bunches of grapes, which project from the surface of the serous membranes. At a later period, these neoplasms become pedunculated, and the small nodosities are separated from each other by some vascularised bands of connective tissue. Still later, lime salts are deposited in them in the form of points or reticulations, and the transformations still continuing, the nodosities finally become a softened mass resembling thick mortar.

The illustrious Berlin professor states that he has never observed any other transformation of these neoplasms, than calcareous infiltration and partial fatty degeneration.

It is only in exceptional cases that, in the course of this malady, alterations are not found in the lymphatic glands of the head, neck, or chest, or in the submaxillary, parotidean, superior, middle, or inferior cervical, the maxillary, prescapular (*glandulæ cervicales*, Hom.), superior and inferior parietal (*glandulæ sternales*), thoracic (*glandulæ parietales superiores et inferiores thoracis*, Hom.) glands. The lesions are also met with in the anterior and posterior mediastinal, as well as in the bronchial lymphatic glands.

These glands are at least more or less enlarged, have a dull yellowish colour, and are impregnated with juice, or they are pigmented. Frequently, also, there are hæmorrhagic centres the size of a pin's head, with notable increase in volume and induration of these glands, and irregular contours. On section, the cut surface shows numerous infiltrated points, the size of a grain of millet to that of a pea, grey, yellow, or white in colour, and having the consistency of cheese or mortar. There are also larger centres, irregular in outline, and formed by masses having analogous characters to those just described.

In addition to the nodosities on the serous membranes, and the nodular and caseous transformations met with in many of the lymphatic glands, pulmonary lesions are found in the majority of the animals affected with tubercular phthisis. These are in

the form of nodules and nodosities, possessing similar characters to those already mentioned; in the lung parenchyma they are observed to be in all their stages of evolution, from the hæmorrhagic points to the caseous and calcareous nodosity. Besides these connective-tissue vegetations, which may cause complete obsolence of the pulmonary lobules and acquire considerable dimensions, and are at the same time often permeated with centres of regressive transformation, there are other irregularly-formed centres of various dimensions, caseous in appearance, and situated in the pulmonary parenchyma, which do not present any other abnormal character.

Sometimes the pleural nodules or nodosities of the costal or mediastinal pleura extend to the parietal or visceral pleuræ, and bring about adhesions between the lungs and costal walls, or the mediastinal septum or pericardium. It may even happen that the pleural nodosities penetrate the pulmonary parenchyma, and the invasion may be so complete that it is impossible to distinguish the pulmonary from the pleural nodosities.

The conglomerated nodosities which form the caseous or mortar-like masses may, if they are situated beneath the pleura, penetrate the latter, throwing their contents into the pleural cavities, and give rise to a rapidly fatal Pleurisy, or to Pneumothorax. If the masses of nodosities are found in the vicinity of a bronchus, they may open into its cavity, and their contents be expelled in discharges from the mouth or nostrils. When these softened centres open into the pleural sac or the bronchi, there results the formation of abnormal cavities in the pulmonary parenchyma; these are the so-called *vomicæ* or *caverns*.

The following is a very exact description of the necroscopic lesions met with in tuberculous animals; it is taken from the *Dictionnaire de Médecine Vétérinaire* of Hurtrel d'Arboval (Paris, 1839. Vol. v., p. 35):—

"The ribs having been removed from the carcase of a cow sent to the knacker, the pleura was found to be entirely covered with tubercles variously disposed and variable in volume, the largest not exceeding in size that of a nut; they were arranged in lines in some parts, in chaplets in others, and especially where the lungs had contracted adhesions; the whole of the right lung

was studded with tubercles more or less large, some being imbedded in the tissue of the organ, while others, more superficial, were only attached to it by a pedicle. The extremity of this lung was converted into a concrete matter, of the same nature as the tubercles. The left lung offered a similar concretion, with regard to its nature, but less in extent; the mediastinæ were transformed into a mass of tubercles arranged like the cotyledons of a cow which has just calved; the bronchial glands were greatly engorged; the abdomen offered the same kind of lesions as those found in the chest. The peritoneum was, like the pleuræ, studded with tubercles in every respect the same as those described above; the mesenteric glands were very consistent, of a dark grey colour, and they had acquired an enormous volume."

These nodules are not only met with on the serous membranes, lungs, and lymphatic glands; they are also found in other organs, and particularly in the mucous membrane of the larynx and trachea, pharynx and œsophagus, being situated in the membrane itself, or in the submucous connective tissue, where they readily become softened, and then give rise to the formation of small ulcers disposed in a funnel-shaped manner; these, in becoming confluent, cause the loss of much substance, abscesses in the submucous connective tissue, and necroses of the already ossified cartilages. These nodosities comport themselves, in this respect, absolutely like the pulmonary tubercles which throw their contents into the pleural or bronchial cavities, and like the glanders nodosities of the mucous membranes or skin which ulcerate.

We may be permitted to give some examples of these ulcerations, as observed in tuberculous cattle. Schruber, a veterinary surgeon in the district of Eglisau, reports the following case: "An extremely emaciated cow succumbed while in advanced pregnancy, and after having, in the preceding year, suffered from a violent affection of the chest, with considerable tumefaction of the thyroid glands and all the parts in the vicinity of the larynx, though its health improved afterwards. On opening the carcase of this animal, there were found in the lungs a considerable number of indurations, some small, others voluminous.

These organs were, besides, the seat of purulent centres containing liquid pus and a concrete gritty mass. On the inner surface of the trachea there were three very extensive ulcers in active suppuration, one of which had extensively invaded the larynx. All the other organs were healthy.*

Veterinary Surgeon Casper Krauer cites the case of a phthisical cow which, while eating, pawed the ground with one or other fore foot, swallowed with difficulty, salivated abundantly, but rarely coughed. At the autopsy he found tubercles in the mucous membrane of the trachea.†

Walley shows in Plate X. of his work,‡ a drawing of tubercles and tuberculous ulceration of the larynx; the second figure in the plate represents the tuberculous transformation of the tracheal mucous membrane.

Connective-tissue hypertrophy, as well as nodules and nodosities analogous to those already described, are also met with in the tongue and lips. But, according to Bollinger, these alterations in Tuberculosis must not be confounded with the indurations of the tongue known in Germany as "Holzzunge" (*Wooden tongue*), which are the consequence of the development of the *Actinomycetes bovis* (Harz); these parasitic nodosities are sometimes found in process of cretification.

On the envelopes of the encephalon, as well as of the spinal cord (especially on the pia mater and arachnoid), and, in certain cases, even in the substance of the brain and medulla oblongata, there are sometimes found yellow nodules the size of a grain of millet to that of a hemp-seed. These may collect into a mass at a certain point, and constitute a tumour or vegetation sufficiently voluminous to compress one part or another of the brain or spinal cord, occasioning those nervous disturbances already alluded to. The nodosities situated in the brain not unfrequently soften, and give rise to more or less extensive puriform centres.

At Willer (Upper Alsace), where Tuberculosis is very prevalent, Zundel has found, in making an autopsy of two cattle which had succumbed to the contagious disease of the head, numerous grey granulations, the size of a grain of millet, on the membranes

* "Archives Suisses de Médecine Vétérinaire." Zurich, 1847, p. 383.
† *Ibidem.* 1857, p. 242.
‡ "The Four Bovine Scourges." Edinburgh, 1879.

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of the brain. One of these animals had also tubercles in the bronchial glands. In another animal tubercles were found in the skin of the forehead, one of which was as large as a pea and had yellow contents, while similar neoplasms were met with in the bronchial glands, and in the left lung were tuberculous granulations, varying in size from that of a pea to that of a nut. From these appearances, Zundel was of opinion that the contagious disease of the head of cattle might very well be accepted, in veterinary medicine, as representing the tuberculous meningitis of children, first described by Russ and Gerhard.*

We have already mentioned the existence of tubercular nodosities in the abdomen of animals affected with this disease; these may be situated on the mesentery, in the mesenteric glands, or on the omentum. The veterinary surgeon of the district Von Ow, mentions a special kind of colic observed in the cow, and due to the tubercular transformation of these parts; he is even able to diagnose, during life, the special nature of these colics, in having recourse to exploration of the rectum.†

It is not rare to find, at the same time as the alteration of the mesenteric glands is met with, that special morbid condition of the intestinal mucous membranes described by Professor Niklas, of the Munich Veterinary School, under the name of Intestinal Tuberculosis, in the following terms:—"This morbid condition has not yet, I think, been described. Köll formally declares that he has never met with intestinal Tuberculosis, not even when the lesions of this affection were found in other organs. I have had the opportunity of observing this alteration in more than twenty cows, not only in animals whose other organs were affected with tubercles, but also in those which nowhere else gave evidence of the existence of the disease. In these cases the tubercles were of variable dimensions, from the volume of a pin's head to that of a hemp-seed; they were seated on the internal surface of the serous membrane, and sometimes in very considerable numbers, disseminated throughout the whole of the intestine, or accumulated in certain points.‡

* "Recueil de Médecine Vétérinaire." 1872.
† "Thierärztliche Mittheilungen Von Lydtin." 1881, p. 79.
‡ "Wochenschrift für Thierheilkunde und Viehzucht." Third year, No. 52, p. 434.

It is in this group of maladies that must also be included that intestinal disease of the pig, which so often causes fatal constipation or diarrhœa, and to which the designation of Scrofulosis is given when its course is chronic.

The district veterinary surgeons in different localities of the Grand Duchy of Baden have often remarked, in their reports, on the frequency of Tuberculosis among the animals fed on the residues of the distilleries and kitchen refuse. The infection in these cases, they state, had its point of departure in the intestinal canal, as nodules were rarely absent from it.*

The nodules of Tuberculosis are also met with on the surface of the liver and spleen, but most frequently in the parenchyma of these organs; and the kidneys are not exempt from these lesions.

According to a recent communication of veterinary surgeons Fischer of Wolfach, and Merkle of Zell, a form of incurable and fatal chronic hæmaturia met with among the cattle in the Black Forest, is due to a tuberculous and ulcerative transformation of the coats of the bladder.

The genital apparatus may likewise show nodules of Tuberculosis, as they have been found in the vaginal sheath and in the testicle,† in the spermatic cord and efferent ducts, as well as in the prostate.‡

In female animals these lesions are rarely met with in the mucous membrane of the vagina; but they are frequent in the uterus, Fallopian tubes, and ovaries.

In the collection of pathological specimens at the Veterinary School at Karlsruhe (which is no longer in existence), there was a uterus weighing more than fifty kilogrammes (3½ cwts.), the walls of which had attained a thickness of three centimètres (about 1¼ inch), as a result of the production, in multiple layers, of yellow nodosities and connective-tissue vegetations between these. The numerous ulcerations on the surface of the mucous membrane of this uterus gave it a kind of resemblance to an empty honeycomb.

* "Mittheilungen über das Badische Veterinärwesen, 1874-1880." Karlsruhe, 1882, p. 78.

† *Ibidem.*

‡ Walley. Op. cit., p. 176.

The formation of tuberculous nodosities in the udder, which had been mentioned so long ago as 1849, has a real importance. From the report issued by the direction of medical affairs of the Canton of Zurich for the year 1849,* it would appear that Nägeli observed a case of localisation of this disease in the mammary gland, and which he reports in the following terms:—"A cow showed, between the teats of the udder, nodosities which were at first supposed to be the ordinary milk indurations, but at a later period they became very painful, softened, and gave rise to ulcerations. The loss of substance thus produced caused an abundant discharge of sanious and corrosive fluid. At the commencement, the secretion of milk was evidently scarcely altered, except that it was diminished in quantity. The cow became emaciated and fell into a cachectic condition"

Degive, professor at the Brussels Veterinary School, and Van Hertsen, inspector at the abbatoir of that city, have presented to the Brussels Academy of Medicine a memoir on the localisation of this affection in the mammary glands and in the muscles.

The veterinary surgeon of the Von Ow district, in Baden, relates the case of a cow which had the localisations of Tuberculosis in the mammæ.† "A brown cow, of a delicate constitution, but a good milker, was attacked by a violent inflammation of the left half of the udder, which resisted every kind of treatment. The udder increased in size, especially the left side, and the secretion of milk was completely suspended. When the symptoms had continued for several weeks, the cow commenced to cough and to breathe with difficulty—phenomena which were soon complicated with manifestations of fever. The diagnosis was pulmonary inflammation. The animal, being still in good condition, was killed, and on examination of its body there were found tuberculous nodosities on the pleura, as well as in the udder, where they were in great number."

Veterinary surgeon Fischer, of Wolfach, has reported an analogous case, in a discourse at a meeting of Badenois veterinary surgeons held at Friburg in 1882.

* "Schweizerisches Archiv für Thierheilkunde." New series. Vol. XI., p. 243.

† "Thierärztlichen Mittheilungen." 1879, p. 103.

Fünfstuck, Dinter, Ackermann, Hartenstein, König, and Präger have also given similar instances, if we may judge from the reports of veterinary surgeons in Saxony for the years 1870, 1872, 1874, 1875, 1876, and 1879.

Tuberculosis of the mammæ has also been mentioned in the works of Gluge, Bruckmüller, and Furstenberg. It is also alluded to at length in the *Thierarzt* by Anaker (1878, p. 104), the *Oesterreich-Monatschrift für Thierarzt* (1879), the *Mittheilungen aus der Thierarztlichen Praxis* (Prussia, new series, 1879-80, p. 14). The presence of these nodosities in the muscles is a fact of not less importance than that of their existence in the mammæ.

Tuberculosis of the cardiac muscle has been mentioned by Ruff, veterinary surgeon in the district of Bretten, and by Von Ow at Stockarch,* by James,† and by Surber.‡ The latter found a tuberculous tumour weighing twenty-seven pounds on the heart of a fat ox.

In the anatomo-pathological collection of the Berlin Veterinary School, there is preserved a piece of flesh full of miliary nodules, and Dr. Schütz of that school has noted that these small nodules are situated in the intermuscular substance. In animals which are in an advanced stage of Tuberculosis, we often find tubercular productions in the intermuscular lymphatic glands, but which often pass unnoticed.

The neoplasies of Tuberculosis are also often encountered in bones and the articulations. According to Walley,§ the lesions of this disease are relatively more frequent in the cancellated than the compact tissue of bones. They are more especially met with in the spongy portion of the temporal and occipital bones, as well as in the spinous processes of the dorsal vertebræ. The diplœ of the bones are, in these cases, the seat of an inflammation and exudation which produces an hypertrophy, with softening, of this tissue; the nodosities are deposited in the substance of the new formation, and are easily recognised.

* "Thierarztliche Mittheilungen von Lydtin," 1875, p. 51.
† *Veterinarian*, 1873.
‡ "Schweizerisches Archiv für Thierheilkunde." Neu Folge. Band XI., p. 42.
§ *Op. cit.*, p. 179.

With regard to Tuberculosis of the long bones, it proceeds either from the spongy tissue of the epiphyses or the endosteum, and perhaps in certain cases from the periosteum alone.

In making the autopsy of a bull which, during life, had exhibited symptoms of a cerebral lesion, and especially of deranged motility, sensibility, and intelligence, while at the same time there was a discharge from the right ear, Krebs found, in addition to tubercles in the lungs, a large tuberculous centre which had invaded the temporal, sphenoidal, and occipital bones.* These were partially softened, and the altered parts contained tuberculous neoplasms. In the neighbourhood of the left temporal bone, the pathological productions had perforated the dura mater, the inner surface of which they covered with a layer of fungous growths. The left half of the brain, as well as that of the cerebellum, had deep depressions in which these neoplasic masses were imbedded. In the region of the sphenoid and occipital bones, these tuberculous vegetations formed, on the surface of the dura mater, a layer about two centimètres in thickness ; the petrous temporal was nearly destroyed, and the cavity of the tympanum was filled with pathological productions similar to those existing elsewhere. A fistulous canal commenced at the external auditory meatus and passed into the cranial cavity, passing through the petrous temporal. The pia mater was the seat of numerous tubercles.

Utz, an arrondissement veterinary surgeon, reports a remarkable case of articular Tuberculosis as follows:—"A cow, five years old, exhibited during life the ordinary symptoms of pulmonary Tuberculosis, *i.e.*, deranged nutrition, progressive emaciation, dyspnœa, varied abnormal respiratory *bruits*, cough, movement of the hind limbs very difficult, and walking stiff and slow, with marked lameness. One of the knees was moderately swollen, and painful on pressure, but was not increased in temperature."†

This cow was killed, and at the autopsy Utz found, in addition to the lesions of Tuberculosis on the two pleuræ, numerous cretified and caseified nodosities in the lungs and liver. On

* "Archiv für Thierheilkunde." Vol. VII., p. 148.
† "Thierarztlichen Mittheilungen," 1881, p. 34.

opening the diseased knee, he discovered, covering the entire surface of the synovial membrane, numerous tubercular neoplasms disseminated in places, or collected in more or less considerable groups elsewhere. These neoplasms were indurated, and a large number were cretified; the synovial membrane showed, besides, fleshy vegetations resembling the filamentous masses on the pleuræ, many of which contained tubercular nodosities of a yellowish-red tint.

Weigert has met with the characteristic nodosities of this malady in the walls of veins, and Ponfick has found an infiltration, with tuberculous ulcerations, in the thoracic canal.

In general, the alterations of this affection are only observed in the lymphatic glands of the head, neck, and chest, at the same time that they are found on the pleuræ and in the parenchyma of the lungs; in rare cases they are only noted on the pleuræ or in the lungs.

With regard to the frequency of these alterations in different parts, we might place, in the second line, the abdominal and pelvic organs, and particularly the genito-urinary organs. In the third line come the central organs of innervation, with their envelopes; and after them we may place the bones, articulations, muscles, and intermuscular connective tissue (Schütz), and, lastly, the vessels.

According to the investigations of Göring (Bavaria), in one hundred tuberculous cattle, there were found lesions in—

	In 1877.	In 1878.
lungs and serous membranes	in 41 cases,	in 47 cases;
lungs only	„ 33 „	„ 34 „ ;
serous membranes only	„ 17 „	„ 15·3 „ ;
tubercles in other organs	„ 8 „	„ 3·5 „ ;

Of 1,596 cases which were carefully investigated in the Grand Duchy of Baden, the following results were obtained:—

21 per cent. with pulmonary lesions only;
28 „ „ peritoneal and pleural lesions only;
39 „ „ pulmonary and pleural lesions only;
9 „ „ generalised Tuberculosis;
3 „ „ genital lesions only.

(To be continued.)

Editorial.

THE INTERNATIONAL VETERINARY CONGRESS OF 1883.

THE fourth International Veterinary Congress commenced its labours at the Palais des Academies, Brussels, on the morning of the 10th, and concluded in the forenoon of Sunday, 16th September; every day had been devoted to the discussion of the important subjects previously brought before the members, in the form of reports prepared by commissions appointed by the organising committee.

The Congress was attended by delegates sent by almost every European Government, and by those nominated by several Veterinary Societies in different countries. The United Kingdom was represented by three of its veterinary surgeons, Mr. Cope (in the inevitable absence of Professor Brown), sent by the English Government; Dr. Fleming, delegate of the Royal College of Veterinary Surgeons; and a young member of the profession, Mr. Young, who attended as a visitor. The United States were represented by Professors Law, Liautard, and Robertson. The Congress was very largely attended, the fine room in which its meetings were held being, particularly in the earlier days, crowded to excess. The Belgian Minister of the Interior (the Congress being under the direct patronage of the King of the Belgians) was to have opened the proceedings, but as he could not attend, his Director-General, M. Somerhausen, officiated in his stead, and welcomed the delegates, while pointing out the importance of the questions to be brought forward. Professor Thiernesse, late Director of the Brussels Veterinary School, was elected President, and Bouley, Jacops, Müller, Röll, and Wirtz, were chosen Vice-presidents, with Dr. Wehenkel as General Secretary. In the absence, through illness, of Professor Thiernesse, Professor Bouley assumed the duties of President. The sittings were commenced at nine or ten o'clock in the morning and generally continued until four in the afternoon, and the discussions were at times very animated and the amendments numerous. Decisions were arrived at in nearly all the important questions.

In our next issue we shall give a *resumé* of the discussions and their results, and we trust that these will be carefully considered by the various Governments.

At the close of the Congress, it was decided that another should be held within five years, and London, Carlsruhe, and Paris, were proposed as the meeting place, the majority finally voting for Paris. The business terminated with a banquet given by the Belgian veterinary surgeons to the Members of Congress, who, we are certain, will ever entertain a lively recollection of the courtesy, hospitality, and attention of their hosts, and particularly of the great ability and amiability of the General Secretary, Dr. Wehenkel, to whom much of the great success attending this imposing gathering of the principal *savants* of the veterinary profession throughout the world, is due.

THE DISEASES OF MONKEYS.*

BY J. B. SUTTON, SENIOR DEMONSTRATOR OF ANATOMY, ETC., MIDDLESEX HOSPITAL.

THERE is a notion prevalent, not only in the medical profession, but in the world at large, that monkeys kept in confinement in this country die chiefly from tubercle. I am not aware of any statistics or exact researches having been published on this subject before, but during the past eighteen months certain facts have come to my notice which seem of sufficient interest to be placed on record. In October, 1881, the Zoological Society very kindly permitted certain members of the Pathological Society to attend the *post-mortem* inspection of animals dying in their gardens in Regent's Park; consequently, since that time I have had ample opportunity of making careful examination of the bodies of a very great variety of animals. Many and various have been the points of interest which have turned up in the course of the investigation, but none more interesting than those which relate to the diseases of the quadrumana. Previous to my attendance at the gardens it seems to have been the custom to use the word tubercle, or Tuberculosis, in a generic sense, including under this term all such affections as Pneumonia (lobar and lobular), empyema, abscess, caseous glands, and the like; hence, possibly, the origin of the error regarding the frequency of Tuberculosis. From Dec. 1st, 1881, to March 30th, 1883, an interval of sixteen months, 110 quadrumana of various species died. Of this number I was able personally to examine the viscera of ninety-three. The causes of death were as follows:—

1. *Tubercle.*—This was the cause of death in three instances only. Two occurred in Rhesus monkeys from India, the third in a vervet monkey, also an Old World species. The disease was unmistakable: tubercular Phthisis associated with cavities in the apices of the lungs, in every point resembling the condition met with in the human subject.

2. *Bronchitis.*—This proved fatal in twenty-two cases, in some being associated with emphysema, generally vesicular, but occasionally of the interlobular variety. Even a slight attack of Bronchitis appears to be rapidly fatal.

3. *Pneumonia* in its lobar form is not so common; three deaths alone could be satisfactorily traced to this cause. The lobular form is frequent, seven deaths having been occasioned by it; three of the cases occurred in lemurs, in one instance being associated with hæmorrhagic cystitis, for which there was no obvious cause. Possibly the frequency of lobular Pneumonia results from the prevalence of Bronchitis.

4. *Empyema.*—This caused death in two cases. An abscess in the lung burst into a bronchus, filled up the trachea, and thus suffocated a baboon. A pretty specimen of squirrel monkey died from œdema of the lung.

5. *Septic Pneumonia.*—A not uncommon mode of death in young animals is alveolar abscess, leading to ulceration and sloughing of the gum; the purulent discharges are inspired (possibly during sleep) and septic Pneumonia established, sometimes leading on to gangrene of the lung. This proved fatal in a young chimpanzee.

6. A very unexpected cause of death manifested itself in bone disease, in the form of typical *Rickets*, and a remarkable softening of bone having all the characters of mollities ossium, except that it occurs in young animals.† All the bones suffer, and the ribs become so soft that they yield to atmospheric pressure, giving rise to pulmonary collapse and death. Several instances of

* From *The Lancet.*

† It is very probable that mollities ossium is not confined to adults, but that a form f this singular disease attacks young subjects of the human species.

this disease have been shown at the Pathological Society during the past session, so that it is unnecessary to enter into details here. Three baboons and several monkeys of different species succumbed to this curious affection.

7. *Scrofula* was well marked in three cases: the first, a baboon with caseating glands in the neck; the second, a small Capuchin monkey, with suppurating glands in the axilla, posterior triangle, and groin; and lastly, a Rhesus monkey with a caseating mass in the dorsal region, associated with spinal caries and paraplegia, death being eventually caused by Meningitis, which extended upwards to the cranium. A large abscess had also formed behind the sternum, conpressing the right lung and forming a bulging on the interior of the pericardium. This projection pressed on the auricle between the point of entrance of the superior and inferior venæ cavæ, and had given rise to a large and well marked milk-white patch as a result of pressure.

8. *Intussusception* of the jejunum killed a very fine specimen of lemur. One of these creatures also died from what appeared to be Leucocythæmia. The spleen was enlarged fifty times above its normal bulk, and the liver was uniformly studded throughout with little white bodies composed of lymphoid tissue. The proportion of leucocytes in the blood was as one to eighty red corpuscles. This is interesting, inasmuch as these creatures come from Madagascar, an island famous for ague. Many lemurs also suffer from Cataract. The reason is not very obvious. A caseating bronchial gland perforating the pericardium, thus setting up purulent Pericarditis, proved fatal in another lemur.

It has been stated that one of the disadvantages resulting from the assumption of the erect posture by man is the occurrence of herniæ in both sexes, anteflexion and retroflexion of the uterus in females. I have a uterus taken from a baboon with acute retroflexion of the fundus associated with atrophy of its anterior wall. No history could be obtained as to whether she had borne young ones. Hydatids of the peritoneum were found in two instances, but were not the direct cause of death.

9. *Typhoid Fever* proved fatal in three lemurs and one monkey. Two lemurs lived together in the same cage. The first one which died from this affection suffered from profuse diarrhœa, the ulcers being confined to the immediate neighbourhood of the ilio-cæcal valve; death resulted from perforation of the ileum. The second died seven days after its companion from severe hæmorrhage; ulceration of agminate and solitary glands had taken place from the commencement of the ileum to within half an inch of the anus. I think it very probable that the second lemur contracted the disease by direct inoculation from its mate, for the following reasons:—(*a*) The first animal which died was the one first affected, or at least was the one first noticed to be ill. (*b*) The fæcal discharges were so profuse that the keeper had difficulty in keeping the cage clean. (*c*) The companion lemur jumping about the cage not merely contaminated her own body, but occasionally dropped her food in the fæces, thus taking the morbid material into the alimentary canal in direct contact with the Peyerian glands. (*d*) The creature was not found to be ailing until some days after the first one was affected. (*e*) The unusual length of intestine found ulcerated also lends support to the notion of direct contagion.

The two remaining cases were very mild compared with the above. Arranged in a tabular form, the list reads thus:—Tubercle, 3 deaths; Bronchitis, 22; lobar Pneumonia, 3; lobular Pneumonia, 7; septic Pneumonia, 1; empyema, 2; abscess of lung, 1; œdema of lung, 1; atelectasis, 10; Scrofula, 3; intussusception, 1; Leucocythæmia, 1; Typhoid Fever, 4: the total being 59.

This list accounts for fifty-nine out of ninety-three deaths, leaving thirty-

four unexplained. In these no lesion was met with sufficient to explain the deaths of the creatures. The species which give most trouble in this respect are the little marmosets and squirrel monkeys. Although I have inspected *post mortem* twenty-five of these creatures, in not more than two was it possible to assign a satisfactory cause of death. Some of them were said by the keeper to have died in a "fit," but careful examination of the nervous system failed to detect any abnormal condition.

Lastly, three points forcibly arrest the attention in glancing over the list:—1. The infrequency of tubercle. 2. The remarkable absence of tumours. 3. The absence of kidney disease of any description.

ON THE RAPID AND DIRECT ATTENUATION OF VIRULENT CULTIVATIONS BY THE ACTION OF HEAT.

BY A. CHAUVEAU.

THE present observations are perhaps of great practical importance; this I will explain hereafter. In the meantime, I will only consider them from the point of view of the general physiology of viruses—a study to which I have devoted a large number of experiments with the *Bacillus Anthracis*, in performing which I have been aided by the intelligence and zeal of Dr. Wosnessensky.

The initial researches of M. Toussaint, confirmed and explained by Pasteur, have demonstrated that the heating of Anthrax blood is capable of considerably attenuating the virulence of the Bacilli it contains; and I have demonstrated that this attenuation may be graduated, it might be said at will, by varying the conditions in heating. I am now about to prove that this heating, considered as a method of *quasi* instantaneous attenuation of viruses, may be applied to artificial cultivation fluids with much more success than to the natural humours of the animal economy—humours which are difficult and delicate to handle, while procedure with regard to the cultivations is as simple as it is certain in its results.

The following is my mode of procedure. I sow sterilised broth with fresh Anthrax-blood. The *matras* are then placed in a thermostat, and maintained at a temperature of 42° or 43° (Cent.), as in Pasteur's method. But instead of keeping the *matras* for twelve or thirteen days in the thermostat, they are removed in about twenty hours, to submit them to a temperature of 47° for one, two, three, or four hours, or even longer. The operation is then terminated; it has not destroyed the vitality of the cultivated virulent agents, but they have lost more or less of their noxiousness, according as the heating has been more or less prolonged.

The first period of the operation—the heating in the thermostat at a temperature of 43° for twenty hours—corresponds to the proliferation phase of the virus. There is nothing to be said as to the preparation of the cultivations. I employ chicken broth, thin and very clear, into which I allow a drop of blood, very rich in Anthrax rods, to fall. I prefer this sowing to that with spores of previous cultivations, in order to avert the danger (no doubt chemical) which results from the non-transformation of some of these very resisting agents. The important object in these cultivations, in fact, is to obtain the virulent agents in a form which leaves them very accessible to the influence of heat. This indication is perfectly realised in the above-mentioned conditions. The broth soon becomes turbid by the formation of a mycelium, which breaks up into small filaments or short rods, analogous to the Bacilli of fresh blood, upon which heating has such a powerful influence.

XUM

I have examined these elements in a large number of cultivations; they sometimes offer a perfect homogeneousness of structure, without a trace of spores, but it often happens that, in examining them more carefully, there are seen in some filaments one or more refrangent, completely spherical corpuscles, a little faint and smaller than the true spores of ordinary cultivations. Even in certain cases the apparent spores are shown in great number; the major part of the filaments or rods show them in their interior, and then the refrangence of these corpuscles is more marked, while neither in their form or size can they be differentiated from the spores of normal cultivations. If Koch, in asserting that the temperature of 43° does not prevent the formation of spores, has heard mention made of the elements which I describe, he has stated a fact, the correctness of which cannot be disputed.

Experience has taught me that the presence of these rudimentary spores, on the contrary, does not hinder the attenuating influence of heating at a temperature of 47°. It would be quite another thing if these were true spores, endowed with all their definite physiological properties. Like M. Pasteur, I have not seen these normal spores, as resisting as infective, develop in cultivations made at a temperature of 42° or 43°. They certainly never exist; and the demonstration of this fact is rigorously afforded by the series of experiments now alluded to, in which the heating to 47° sufficiently prolonged has never allowed the primary virulency of cultivations at 42° or 43° to remain.

It is not absolutely necessary that the phase of proliferation should be accomplished at the temperature of 42° or 43°, in order to produce virulent agents which will yield to the attenuating influence of heating. I have seen cultivations made at the temperature of 40° or 41° comport themselves like the preceding. But this is very transitory; notwithstanding the short duration of cultivation, there may form some true and very resisting spores which heating to 47° will not modify, so far as their infective properties are concerned. It is necessary, therefore, to keep exclusively to the classical procedure. Otherwise, when the filaments or rods of the Bacillus anthracis are developed at the temperature of 42° or 43°, they are certainly more impressionable to the action of heat—even the temperature of 43° is capable of producing the commencement of very slight attenuation. And if it is not desired to trench upon the second period of the operation, it is well not to prolong the first period too much. I have mentioned twenty hours as the average duration—what it really has been in the majority of my experiments. But the period may be diminished if development has been extremely rapid—which happens sometimes with blood cultivations, especially if the sowing has been abundant. And if development is very slow, the time should be prolonged, even doubled if necessary. The turbid condition of the fluid is the indication.

The second period, which corresponds to the phase of attenuation, does not imply delicate manipulation, like the first. In removing the *matras* from the thermostat they are placed in the second heating apparatus, after removing by a pipette the fluid intended for testing the activity of the cultivations. Two factors intervene in the attenuation which the heating produced: the degree of elevation of temperature, and the length of time to which the fluid is exposed to the increased heat. If the value of the first of these factors diminishes, that of the second should increase, and reciprocally. From my numerous experiments it results that heating for three hours at a temperature of 47° is sufficient to transform the very virulent filaments and rods of primary cultivations into inoffensive agents, so far as the guinea-pig is concerned.

Heating does not modify the external appearance of cultivations; it suspends, in fact, all proliferation of filaments and rods, but it is not opposed to the development of rudimentary spores.

I have stated that with this method of attenuation, the cultivations may be graduated at will, by heating to a degree in proportion to the attenuation required. This is one of the interesting points in connection with my researches; and to assure myself exactly as to the results of my test inoculations, I have always made them on the guinea-pig, by injecting beneath the skin of the thigh one or two drops of fluid, according to the size of the animals. In these conditions, if the same cultivated fluid supposed to be very active is comparatively tested before heating, and after heating for one, two, three, or four hours, this is what happens: all the guinea-pigs inoculated with the non-heated fluid die rapidly, in about twenty-four hours, with considerable local œdema. Those which receive the fluid which has been heated for an hour nearly all perish, but less rapidly than the first; while the fluid heated for two hours is much less active, as some of the animals are later in dying, and there is only trifling local infiltration, an equal number surviving. The fluid heated for three hours never kills adult guinea-pigs, nor even produces any appreciable local accident. When the fluid is heated for four hours or longer, this is still more apparent; and nevertheless the virulent agents contained in these inoffensive liquids have preserved their prolific faculty —an important point which merits to be treated apart.

The experiments I have devoted to this comparative study as to the influence of the duration of heating, have been extremely multiplied, and I have certainly obtained numerous variations in the results obtained; but I have not had a single instance in which the general course just indicated was not followed. The differences are due to the degree of initial virulence acquired by the cultivation during its development at the temperature of 42° or 43°. It often happens that this virulence is already greatly diminished after being heated for an hour at a temperature of 47°; and the result of inoculations is then characteristically simple; the animals inoculated with the non-heated fluid alone perish, and that rapidly; the others survive inoculation.

According to the experiments I have made, the primary virulence should be in inverse proportion, its attenuation in direct proportion, to the number of rudimentary spores which alter the homogeneousness of the protoplasm of the filaments and rods.

It is therefore ascertained that heating is an excellent means of attenuating, *quasi* instantaneously, virulent cultivations prepared in certain conditions. If this attenuation might be considered as the indication of a specific transmutation, there should be no hesitation in including heat among the number of the most important agents capable of impressing transforming deviations on protoplasm in a state of evolution.

In two ways we may assure ourselves that attenuation by heating does not imply any alteration in the vitality or prolific faculty of the virulent agents which the action of heat has deprived of their infective properties. 1. By means of the cultivation of the first generation submitted to heating, in showing that the evolution has only been momentarily suspended by this operation; 2. By the aid of a second generation cultivation, in proving that the seed furnished by the first cultivation liquid, before the resumption of its development, perfectly fecundated a new soil.

In order to utilise the first procedure, it suffices to place the cultivating bath (*matras*), on removing it from the stove, at 47° (Cent.), in another thermostat heated only to 32° to 35°. The evolution then resumes its normal course; proliferation continues, and development is achieved by the formation of a great number of true spores. From the appearance of the whole, and by the microscopical characters, these cultivations do not sensibly differ from those which have not been submitted to these special conditions, unless the heating has been too prolonged. In general, four hours' heating at 47° does not prevent ulterior evolution, and scarcely disturbs it.

XUM

But it is not to this crude determination of the preservation of the prolific faculty, in the cultivations the development of which has been arrested by the action of heat, that we ought to give the greatest attention. The interest belonging to this point is to be found more especially in the study of the influence of the duration of heating on the resumption of evolution, and in the comparison of the results then obtained with those furnished by inoculation.

We have already seen that inoculation shows the attenuation to be as much more marked as the duration of heating has been prolonged. But I may call to mind also that it often happens in the conditions in which most usually apply the heat, that the cultivations lose all their infective activity after the first stage of heating—after an hour's exposure to a temperature of 47°. It is then no longer possible to determine the gradual increase in the influence of heat. But that which inoculation is not capable of informing us, may be revealed with the greatest definiteness by the results of the recommencement of evolution in the cultivations submitted to the attenuating influence of heat.

I will give a simple example. Three baths (*matras*), containing the same quantity of sterilised broth, are sown with a drop of the same blood and placed in a stove at a temperature of 43°. There they remain for a period necessary for the multiplication of the *Bacilli*—that is, about twenty hours. They are then ready to undergo heating to 47°, which may be done with one bath for an hour, two hours for the second bath, and three hours for the third. A small quantity has been removed from each before the heating takes place. The test inoculations are practised on two series of guinea-pigs—one adult, the other very young animals—each series being divided into four groups of three animals each. Do we find identical results in both series? Certainly not.

In the young guinea-pig series—creatures which are very impressionable to Anthrax infection—there will perish: 1. In about thirty-six to forty-eight hours, all those which have received the non-heated fluid, and which serve as test animals; 2. In eight to twelve hours after, two of the animals inoculated with the fluid which was heated for an hour; 3. A little later yet, one only of the three guinea-pigs which had served as a test for the fluid heated for two hours. With regard to the animals in the last group—those which have been inoculated with the fluid heated for three hours—they survive. These results, which are not rare to obtain as I have described them, well demonstrate, and with a precision *quasi* schematic, that the attenuation is proportionate to the duration of the period of heating.

But in the series of adult guinea-pigs, it is not the same: only those of the first group—the test animals—die; all the others resist the effects of inoculation. If we found ourselves only in presence of this series of experiments we should be much embarrassed to know if there existed gradations in the great attenuation of which they give evidence in a uniform manner for the three degrees of heating. Happily we may be informed on this point by the progress of the ulterior evolution of heated cultivations. If, after the inoculations, the three cultivating baths are placed in a thermostat at 32° to 35°, the development momentarily suspended, resumes its regular course, but not with the same rapidity or activity in the three baths. In about twelve hours the turbidity is notably increased in the bath heated for an hour, less in that which had undergone two hours' heating, and much less still in the bath exposed for three hours to a temperature of 47°. Here there exists a decreasing rate which could scarcely escape the least practised eye. The differences are yet very marked after twenty-four to forty-eight hours, sometimes even after several days. They clearly prove, as the result of the inoculations of the first series of animals, that the influence of heat on the activity of the virulent cultivations is energetic in proportion as the heating is prolonged.

I have said that once achieved, the cultivations now in question are not distinguished, by their objective characters, from those in which the evolution, not interrupted by heating, is accomplished in a normal manner. It might, therefore, be thought that, with their vigorous appearances, they had regained all the virulence belonging to the latter. And there is some foundation for this. If, in fact, these special cultivations rapidly and almost certainly kill guinea-pigs inoculated with them, they are much less deadly with sheep ; a good number of these do not die, and are then endowed with a strong resistance to Anthrax infection. The attenuating influence of heating the cultivations is therefore not ephemeral, as it may be transmitted to a certain extent, when the cultivations resume their course of evolution, to the spores derived from the protoplasm of the rods and filaments which have been submitted to the action of heat.

But where the transmission of this effect of heat is more particularly manifest, is in the facility with which these spores submit to the attenuating influence of heat directly applied to them. Nothing is more easy than to render them, so to speak, absolutely inoffensive, by exposing them for some time to the action of a certain temperature. I call attention to this fact, which is interesting from more than one point of view. It is certainly not impossible to obtain an analogous effect with spores of normal derivation, although they are rightly estimated to be endowed with a very powerful resistance to causes of destruction, and particularly to the influence of relatively high temperatures. But we may, with impunity, leave them for one or one and a half hour exposed to a temperature of 80° (Cent.), without their undergoing any sensible alteration either in their morphological characters or physiological properties. It is not so when we deal with cultivated spores the development of which has been momentarily arrested by heat ; heating under these conditions, respects the objective characters of the spores, which only appear to become a little smaller, but it profoundly modifies the virulent activity. The cultivations may then be inoculated by means of the syringe, without great risk of causing death, in the guinea-pig and sheep, which then acquires immunity.

The cultivations of the second generation may, as well as this primary means which I have described at such length, demonstrate the persistency of the vital activity of the rods and filaments developed at the temperature of 43°, and rendered inoffensive by the action of a temperature of 47°. It is appropriate to say a few words with regard to this second procedure, which also furnishes excellent evidence that the effect of heating is graduated according to its duration. I may refer to the single instance which has hitherto served as an example. From each of the three baths heated to 47° for one, two, and three hours, I withdraw by means of a pipette a certain quantity of fluid. Three other baths being prepared, I allow one or two drops of this fluid to fall into each of them, so that they are sown with rods and filaments attenuated by heat. These baths are then placed in a stove at a temperature of 32° to 35°. What happens to the second generation cultivations? Exactly what happened to the first cultivation, after it had been put in the way of undergoing evolution. The cultivations of the second generation are developed, in fact, as much more quickly as the sowing has been briefly heated, and the differences in aspect which result may persist for several days. The result is that fine spores are produced, possessing the same properties as those of the primary cultivations, and especially the aptitude to be attenuated by heating.

It results, on the whole, from this study, that the attenuating influence exercised by heat on virulent agents is not merely individual, but may make itself felt even on the properties of new agents in which originates the proliferation of the protoplasm which it directly acts upon.

THE INSPECION OF LIVE CATTLE AND DEAD MEAT.

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(*Continued from page* 103.)

In the ox the age is ascertained chiefly by the incisor teeth. These teeth are eight in number, and are all situated in the lower jaw ; the corresponding part of the upper jaw being occupied by a dense, tough, dental pad.

Although as a rule our attention is mainly directed to the incisor teeth in judging the age of a beast, the appearance of the molars or grinders is occasionally a valuable guide, and consequently it is necessary to study briefly the changes which take place in these teeth. I shall frequently make use of the terms "temporary" and "permanent" in speaking of the teeth, and may explain that the former refers to those commonly called sucking-teeth, which have a limited term of existence, and which are ultimately replaced by the latter.

As a general rule we find four incisors present at birth, and these the centre teeth ; but this rule is subject to slight variations, depending upon a variety of causes.

The third pair is usually cut by the twelfth or fourteenth day, and the fourth pair at about the fourth week, so that a month-old calf has the whole of its temporary or sucking incisors *in situ*.

As the jaws increase in width by growth, the spaces between the teeth become greater, and their previously sharp edges become flattened and blunted by wear. The four central incisors assume this condition at about twelve months of age, and at eighteen months this appearance has extended to the rest, but in a less marked degree.

We also find the original whiteness has given place to yellowish lines on their wearing surface, and a discoloured condition of the fangs, caused by the action of the food and the secretions of the mouth.

At one year and nine months the two central temporary incisors are, as a rule, cut and replaced by permanent teeth, and these may be easily recognised by being large, sharp, and fresh-looking, while the temporary teeth are small and blunt.

At about two years and three months the next pair of temporary incisors are cut and replaced by permanent teeth; and at two years and nine months the third pair of temporary teeth are cut ; and at about three years and three months the fourth and last pair are cut and replaced by permanent teeth, so that the dentition of the ox, as far as the incisors are concerned, is complete, although the teeth are not full grown. It is very necessary to remember this in judging cattle certified to be not more than three years old.

The edges of the teeth at this age (three and a quarter years) overlap each other, from the jaw not having yet fully adapted itself to their growth ; at four years of age this overlapping appearance is diminished, and the sharp edges will be worn off the second and third pair of incisors. At five years the teeth will no longer overlap, and they will all have lost the broad, chisel-like shape they had when young.

With each succeeding year this peculiarity will increase, the teeth becoming more blunt and worn, the spaces between them increasing, and their original whiteness giving place to discolouration.

At ten or eleven years of age we find the centre teeth have a square mark on their surfaces, surrounded by a white line, and at about twelve years the whole of the incisors have assumed this appearance.

We will now return to the molars or grinders.

You will remember that at a month old the calf has the whole of the tem-

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porary incisor teeth *in situ*. At this age we also find that the temporary molar teeth are in their place—three above and below on each side, twelve in all. This completes what is called the first dentition. At six months old the fourth molar is put up behind the others, and this is a permanent tooth. The fifth molar, also permanent, is cut at about fifteen months, and the sixth permanent molar at about two years. At this age, then, it will be seen that there are twenty-four molar teeth in the jaws, twelve of which are temporary and twelve permanent.

At two years and six months the two anterior temporary molars are replaced by permanent teeth, and at three years the third permanent molar replaces the temporary tooth, so that at this age the mouth is complete with permanent molar teeth.

In studying the dentition of domesticated animals it must be remembered that certain circumstances, such as breed and other causes, operate in a marked manner in favouring or retarding the development of the teeth.

The age of adult cattle is often judged by the number of rings round the horns, but as this is by no means a reliable guide, and as the marks are frequently tampered with by filing, I do not consider further reference to this peculiarity will be of any advantage.

The age of the sheep, like that of the ox, is judged by the teeth, which are the same in number and arrangement, viz., eight incisors and twenty-four molars, when dentition is perfected.

As a rule, the lamb is born before any of the temporary teeth have cut the gums, but by the time the animal is a week old we find that the four central incisors have appeared; in about ten days the next pair are through, and the fourth or last pair are put up by the fifth week, and are sufficiently developed to allow the animal to graze.

At from twelve to fifteen months of age the two central incisors are shed, and are replaced by permanent teeth. The next pair of incisors are cut at from eighteen to twenty-one months; the third pair at about two years and a quarter; and at about three and a half years, or a little before, the sixth or last pair of temporary incisors are replaced by permanent teeth.

As I have before remarked when speaking of the dentition of the ox, a considerable difference exists between the appearance of the temporary and permanent incisors, and therefore if the periods of dentition are remembered, we shall not have much difficulty in ascertaining the age of a sheep up to four years. At this age the central incisors show considerable signs of wear by becoming flattened at the top of the crown, and the next also present the same appearance, only in a less degree, and the spaces between the teeth have widened from the growth of the jaw. As age increases the teeth become more flattened, smaller and narrower, the spaces between them increasing; discolouration takes place, and eventually the teeth are worn down to the fangs, and some of them will probably be found wanting. A practical fact worth remembering is that all sheep fit for slaughter should have a clean, even set of incisor teeth.

With reference to the molar dentition of the sheep, a very few remarks will suffice.

At birth no molars are cut, but by the third week three temporary teeth, above and below on each side, are through the gums; at, or rather before the third month, the first permanent molars appear. At nine months the next permanent tooth is cut, and at about eighteen months the sixth molar is cut, and is fully up at two years. Very shortly after this period the three anterior temporary molars are replaced by permanent teeth, but as they do not follow any definite order, and are replaced very much at the same time, it is not necessary to consider them in detail.

We now come to that part of our subject which treats of health and

condition, and I would remark that it is not my intention to describe the symptoms of any of the special diseases affecting cattle and sheep, because such a course, however instructive, would scarcely be in character with this paper. I shall therefore merely deal with the general appearances we expect to be present in health or sickness.

In our consideration of "dead meat inspection," it will, however, be necessary to allude briefly to the *post-mortem* appearances of special affections.

If circumstances will admit of it, the animals should be inspected in a yard or paddock, and with respect to cattle it is advisable that the beasts should be seen when standing quiet, and also when ruminating.

A healthy animal should move briskly and easily, the breathing should be regular, the eyes bright, nostrils moist, fæces natural, and coat glossy. When an animal is lying down, any unwillingness to rise and stretch itself should be viewed with a certain amount of suspicion, and the same may be said of any beast showing a tendency to stand apart from its fellows.

When sickness is present we shall probably find that the movements will be sluggish and constrained, eyes heavy, the tongue perhaps will be protruded, coat dry, harsh, and staring, nostrils dry, breathing accelerated and difficult, bowels either constipated or unduly relaxed, the urine may be scanty or very high-coloured, and possibly tinged with blood, and in the case of the cow the teats will be found to be unusually hot.

In addition to these symptoms cessation of rumination will be observed in most cases of sickness, and an arched condition of the spine, cough, or a discharge from the eyes and nose may be present. Foot-and-mouth Disease will of course be detected by an inspection of the mouth, feet, and teats.

It is perhaps advisable that I should allude briefly to two diseases which particularly affect sheep, and which in my opinion certainly render the flesh unfit for food. The first is an eruptive affection designated Variola Ovina, or Sheep-pox, and the second is a parasitic disease of the liver, known by the name of *Distomatosis* or Sheep-rot. Animals affected by Variola may easily be detected by the peculiar flea-bitten appearance on the inner parts of the arms and thighs, cheeks, lips, and other parts of the body not covered with wool. This eruption appears first in the form of small red points, which gradually enlarge, and often unite one with another. These spots soon assume the form of vesicles containing fluid, and as the disease progresses constitutional symptoms are observed, such as quick breathing, lying down, and a discharge from the eyes and nostrils, etc.

The presence of rot may be suspected by the emaciated appearance of the animal, associated with pallor or yellowness of the mucous membranes, sluggishness, loss of hair, diarrhœa, and local dropsical swellings.

In judging the condition and quality of slaughter cattle we must be guided by their general appearance, and by the results of our manipulation, *i.e*, the "handling of the animal's points." A well-fed beast will appear even, and generally well-developed, with a bright coat, while the opposite will obtain in one poor in condition.

The term "stag" is applied to a late castrated ox, and the flesh of such an animal is little better than bull beef, and should not be accepted. Such a beast is recognised by the head being large, the horns thick and stunted, and a general bull-like appearance. A certain amount of fat is necessary to the quality of slaughter cattle, and the flesh should be firm and elastic, and the skin supple. In handling the first rib we should ascertain if a coating of fat exists between it and the hide; for an absence of this, and a bare condition of the bone, indicates a poor and underfed animal. In a well-nourished beast the flank will be full and thick when grasped by the hand, while in a poor conditioned animal little more than the double of the hide will be felt.

A plump sac full of fat indicates that the ox is well fed, while a shrunk and flabby condition denotes the opposite.

The udder of the heifer should be soft and plump, and the teats short; after the first calf the teats increase in length, and the udder becomes hard, and this change becomes more apparent after each calf.

The points of the hips also should be well covered with fat.

Sheep should be examined by dividing the fleece and feeling for a coating of fat on the ribs and loins, the comparative absence of which denotes an animal poor in condition. The same remarks apply to the tail, which should be large and fat.

Slaughtering.

There are several methods of slaughtering oxen and sheep, neither of which possess any special advantages, but it may be well to allude to them briefly in detail.

The usual method of slaughtering oxen is by the pole-axe, and if the operation is performed by a skilful hand, it is perhaps the most preferable of all. The animal's head is pulled down to a ring or post by means of a strong rope placed round the horns, and is struck with the axe in the centre of the forehead. A cane is passed through the hole and into the substance of the brain to ensure an immediate stoppage of sensation.

Another method designated "pithing" is sometimes employed, and this consists of stabbing the animal in the neck immediately behind the poll, with a long thin knife, which penetrates between the joints of the vertebræ and separates the spinal cord. If done properly this plan is not objectionable, as loss of sensation is immediate, but considerable skill is requisite, and, as even the most practised hands occasionally fail at the first blow, the pole-axe is to be preferred.

Sometimes circumstances arise in which it is impossible to catch and secure cattle for slaughter, either on account of the wildness of the animals, want of proper appliances, or other causes, and it is then customary to shoot them. This can be done either in the centre of the forehead (at the part struck with the pole-axe), or just behind the ear. It is necessary to observe certain precautions in order to prevent accidents from the occasionally erratic course taken by a rifle ball.

Whatever method is employed, as soon as the animal is senseless the jugular vein must be severed and the ox raised to facilitate bleeding by means of a wooden bar inserted in slits made above the hocks. In abattoirs properly constructed gallows and tackles are provided, but in the field, a tree and a strong rope will answer the purpose, and if these are not available the blood must be forced out of the body by punching the soft parts of the side with the foot.

Sheep are killed by cutting the throat and thoroughly bleeding.

The process of skinning must be carefully performed, so as not to injure either skin or flesh. The carcase is then opened and thoroughly washed, after the viscera have been removed, in order to clear away all traces of blood, and is then cut up and dressed.

It is unnecessary to go into details with reference to this operation, except to mention that it should be performed quickly while the carcase is warm, and that during the process of cleansing no water should be thrown on the meat, as it facilitates decomposition taking place, especially during hot weather. A clean wiper is all that is required.

The Inspection of Dead Meat.

Having considered the inspection of cattle previous to slaughter, we will commence what may be termed the second part of our subject by briefly

alluding to the inspection of the carcase, including the internal organs. The necessity for this will be at once recognised when I mention, in many cases, diseased meat can *alone* be detected by the appearance of the viscera.

If these are removed, and the carcase skilfully dressed, there is very little difficulty in passing off the flesh of an unhealthy animal for good and wholesome meat.

In the former part of my lecture I have alluded to the immense traffic in diseased meat in this country, and have also stated that under certain circumstances it is generally believed that more than one of the virulent contagious maladies affecting cattle can be transmitted from animal to man. Bearing this in mind, it will be necessary for us to consider the various appearances presented by the internal organs of diseased cattle, before alluding to the essential characteristics of healthy and unhealthy meat, when it is cut up into quarters and joints.

I need scarcely remark that in all cases where any portion of the carcase shows a departure from a healthy condition such animals should be rejected, for although the *cooked* flesh may not be actually injurious, yet it must be understood that the presence of disease is sufficient to account for an altered condition of the meat through the medium of the circulation, and that such flesh must be more or less deficient in nutriment, and of inferior quality.

It will not be necessary to describe the *post-mortem* appearances of the majority of the diseases affecting cattle and sheep, nor will the limits of this paper allow of such a course ; so I shall confine myself to a few of the principal contagious maladies most frequently met with, and will commence with—

Tuberculosis.—In confirmed cases, masses of nodules or tubercles will be seen in the substance of the lungs, on their surface, and also in all probability they will be found attached to the membrane lining the cavity of the chest. These *grapes*, as they are called, are frequently removed by the butcher in dressing, but in most cases the traces of their removal may be detected. Tubercles may exist also on other of the serous membranes of the body, and in or on other viscera.

Fat cattle in good condition, and apparently healthy when alive, are frequently found when slaughtered to be affected with these scrofulous growths. In advanced cases the meat appears watery, pale, and bloodless, and the fat has a dirty yellowish appearance, and is infiltrated with fluid. The presence of tubercles may also be found in the muscular tissue. Of course no animal in this condition should be consumed for food, and it is advisable to establish a rule that all cattle affected with tubercle in any degree should be rejected. This disease exists to a great extent throughout this country, and also on the Continent, and is very prevalent amongst the finer breeds of cattle, particularly shorthorns.

Rinderpest or Cattle Plague.—The symptoms of this highly contagious disease are so well marked during life, that it will in all probability be detected at once by inspection of the living animal, and it is hardly likely that a beast affected by this malady will be selected for slaughter in a Government abattoir. Nevertheless, it is important that we should consider briefly the characteristic features presented by the internal organs.

In this disease we find the lesions extending more or less throughout the alimentary canal.

The rumen, or first stomach, presents patches of claret-coloured congestion. The second and third stomachs are also more or less affected in the same manner, the contents of the omassum being generally in a hard condition. The fourth stomach, or abomassum, is extensively covered with this extravasation ; its contents are frequently mingled with blood, and, more or less, disease of the tissues exists. Both small and large intestines

throughout their whole length are discoloured by patchy and streaky extravasation, and their contents generally are mixed with blood. In very advanced cases the air passages are also much diseased, and ulceration of the larynx frequent. The kidneys are enlarged, heart soft, and often spotted with dark-coloured ecchymose patches. The flesh is generally of a bluish colour, or of a darker red than usual. There is no evidence that the meat, when cooked, is prejudicial to health, but of course it is much altered in quality, is considerably deficient in nutritive value, and should, therefore, be condemned.

Contagious Pleuro-Pneumonia is another specific blood disease, easily detected by the experienced inspector in the living animal, and as its name implies, the organs principally affected are the lungs, and the pleura or membrane covering them, and lining the cavity of chest.

On opening the chest we find, in the more advanced stages of this malady, a quantity of milk-like fluid, with shreds of a semi-solid, white substance (lymph) floating in it, and portions adherent to the pleuræ. There are also adhesions between the pleuræ, forming bands of attachment between the lungs and walls of chest. The lungs being the principal seat of disease, are found to be consolidated and much increased in weight, and when cut into, present a characteristic marbled appearance, and emit a peculiar sickening odour.

Of course, the flesh of cattle affected with Zymotic Pleuro-Pneumonia would naturally be condemned as depreciated in quality and deficient in nutritive value; but as it has been, and is, consumed by thousands of the poorer classes in all parts of the world, we have no authentic reason to suspect its being actually prejudicial to health. As regards the meat, there is no distinctive feature present to enable us to detect any difference between it and the flesh of a healthy ox.

Foot-and-mouth Disease is a contagious malady, the characteristic lesions of which are so well known as to require but little description. We find vesicular eruptive abrasions, and ulceration of the mouth, gums, lips, sides of the tongue, around the coronets, and between the digits of the feet, and occasionally on the udder and teats. The disease is communicable to the human race by means of the milk, but the cooked flesh is generally considered to be innocuous. It should, however, be rejected, except on service where no other meat can be obtained. The symptoms in sheep are much the same as in cattle.

Anthrax, or *Charbon*, is the term applied to a group of diseases affecting cattle and sheep, known as Splenic Fever, Blackquarter, Gloss-Anthrax, or Blaine, etc., and is a malady of the greatest importance, being, under certain circumstances, directly communicable to man, and highly fatal. Each particular form of the disease has its own peculiar *post-mortem* appearances, but certain definite lesions are to be observed in all cases of Anthrax. The carcase is disfigured by accumulations of gas, the result of decomposition. The abdomen is much distended, and the mucous surfaces are frequently covered with red blotches; fluid is found in the serous cavities, the membranes being covered with patches of ecchymosis; the blood is black and very fluid: the spleen is enlarged and gorged with blood, and the liver and kidneys are also enlarged and congested. The heart is soft and flabby, and serous effusion is frequently observed in the muscular and areolar tissues.

With reference to the effect of the cooked flesh of anthracoid animals on the human species, we have many conflicting statements. Instances are quoted of death having been distinctly traced to the consumption of Anthrax flesh, while on the other hand we are told that in scores of cases it has been eaten with impunity. It is enough for us to know its danger, and to

reject such meat at all times and under all circumstances. It is also necessary to warn those men employed in the slaughter of suspected cattle against accidental inoculation, from which innumerable cases of a fatal nature are quoted.

Variola or Sheep-pox.—This disease is one of a highly contagious nature, often very fatal, and as it is at times particularly prevalent, a few remarks on the *post-mortem* appearances may be useful. Those portions of the body where the skin is not concealed by wool will be found to be covered by the characteristic eruption, the nature of which will vary in accordance with the particular stage of the disease, from a simple flea-bitten appearance, to the formation of more or less decided vesicles or pustules. There is no special peculiarity in any particular internal organ, but any, or all of them, may present symptoms of congestion, inflammation, softening, or purulent deposit. These signs are, however, not reliable: so we must trust principally to the eruptive condition of the skin, and to the condition of the flesh, which will be soft, pale, and moist, and in all probability have an unpleasant, heavy odour. The flesh of variolous sheep is unfit for food, and is stated to produce sickness, diarrhœa, and low fever.

Rot in sheep is due to the presence of parasites in the liver and bile ducts, known as the fluke (*Distomum hepaticum*). In examining the carcase, we generally find more or less dropsy present. The flesh is soft, pale, and watery, rapidly decomposing, and the liver is infested with flukes. As these parasites can be transferred to the human species, producing a parasitic affection known as the Echinococcus disease, and as the flesh of sheep affected with Rot is otherwise unwholesome, it should of course be condemned.

Fresh pork can hardly be considered as a recognised article of diet; nevertheless it is occasionally issued for the use of the troops on home service, and it will therefore be advisable to briefly consider two of the principal parasitic diseases peculiar to pigs, and which have a more or less direct influence on the health of man.

Trichinosis is a malady caused by the presence of parasites or flesh-worms (*Trichina spiralis*), which infest the muscles of the pig. Unfortunately this disease is somewhat difficult of detection, except to the experienced eye of the practised inspector, and even then the presence of the parasite can only be correctly ascertained by the aid of the microscope. If, in examining the carcase of the pig, an unusual paleness of the flesh is observed, associated with the presence of minute round specks, such flesh should be subjected to microscopical examination, when the cysts containing the encapsuled parasites will at once be recognised. The terrible results arising from the consumption of trichinosed pork, and the uncertainty which exists as to the degree of temperature necessary to destroy these parasites, are sufficient indications of the necessity of a careful inspection.

It is stated that the process of salting renders trichinosed pork innocuous, if thoroughly cooked.

Measles in the pig is caused by the presence in the muscles of a parasite or bladder-worm, called the *Cysticercus cellulosus*, belonging to the tape-worm class. This parasite being much larger than the *Trichina spiralis*, may be the more easily detected by the naked eye in the form of round bladder-like bodies, which are its cysts containing the worm surrounded by fluid. The muscles of the tongue, neck, and shoulders appear to be principally affected, but other parts of the body, including the internal organs, are also infested. When this disease is suspected microscopical examination should be resorted to. The flesh is generally blanched and softened, the lungs are of a deep red hue, and the liver enlarged and dark-coloured. The flesh is, of course, unfit

for food, from its liability to produce tape-worm, diarrhœa, and symptoms of scurvy in the human species.

I have alluded to the *post-mortem* appearance of a very few of the numerous diseases to which cattle and sheep are liable, for the simple reason that the extent of this paper would not admit of a more exhaustive description, and from the fact that the maladies that we have so briefly considered comprise those of the greatest importance, so far as the healthiness of the flesh is concerned, and include those highly contagious affections which so frequently ravage our flocks and herds, and to which the attention of our Government is so constantly being directed.

From what I have already remarked it must not be supposed that the flesh of animals suffering from ordinary inflammation of any particular organ of the body is in all instances actually prejudicial to health, for under certain circumstances cases may occur where the choice lies between the consumption of such meat or none at all; therefore, although for reasons mentioned in a former part of this lecture, such flesh is less nutritious and of inferior quality, it may be issued on an emergency, providing the animals have been thoroughly bled.

In inspecting the carcase in cases where inflammatory disease of one or more organs of the body has existed, we shall find certain appearances in the flesh which will be presently alluded to generally under the head of diseased meat, and, moreover, certain characteristic symptoms in the affected viscera will be present. For instance, we may have effusions, the formation of pus or matter, adhesions, ulcerations, enlargements, and discolorations, all of which should be considered when inspections of the carcase are made.

I need scarcely observe that none but the flesh of animals entirely free from disease should ever be issued for the use of troops on home service, although in war time it may, as I have just remarked, be necessary to sanction the issue of meat of inferior quality. There are, however, some diseases, other than those I have specially mentioned, such as those of a cancerous nature, or the septic and purulent affections arising from so-called blood-poisoning, that render the flesh at all times unwholesome, and which should invariably be rejected. The *post-mortem* appearances of such cases are of course well-known to experienced inspectors.

I shall conclude this portion of our subject by briefly referring to those cases where medicines have been administered so recently previous to slaughter that sufficient time has not elapsed for them to be eliminated from the system. Although the flesh may not be absolutely unfit for food in every instance, its consumption may possibly be attended by serious consequences depending upon the particular agent administered, and in the majority of cases, the smell and taste of the food will be offensive. As a rule, the presence of medicinal agents can readily be detected in the recently opened carcase, but not after it has been cut up into joints, except during the process of cooking. These remarks point out an additional reason for a careful inspection of the carcase.

We shall now proceed to consider what may be termed the third part of our subject, viz., the inspection of the flesh, and in doing so it will be necessary to again allude briefly to the dressed carcase, after which we shall proceed to describe the characteristic features of good, indifferent, and bad meat, and a few of the impositions practised in dressing, cutting up, etc., especially that frequently-attempted fraud—the passing of bull or cow beef for ox or heifer.

In inspecting the carcase of an animal recently slaughtered and dressed, when the internal organs have been removed, the sides of the chest should be well examined in order to detect any symptoms of lately adherent tubercles or grapes, as well as those signs of pleural adhesions which I alluded to when speaking of the *post-mortem* appearances of Pleuro-pneumonia.

It is a common practice for butchers to remove such diseased products in dressing, and to smear the carcase over with fat, to make it resemble that of a healthy animal.

The pleural and peritoneal membranes should be smooth, and any signs of scraping or peeling must be viewed with suspicion.

In examining the quarters with the view of judging the condition and quality of the meat, both fore and hind must be carefully inspected, for it is a practical fact that the hind quarter always presents the better appearance, and is apt to mislead in judging the general condition of the carcase. The external surface of the quarters should be pretty generally covered with a layer of fat.

This fat should be firm, and, as a rule, white, and not streaked with blood, but it may be remarked that some kinds of food influence the colour of the fat, and also its consistence to a great extent; for instance, oil-cake imparts a yellow colour to this tissue, and all oily foods have a tendency to make soft fat.

Fat is very abundant around the kidneys, and should also more or less cover the inner surface of the carcase, including the abdominal muscles, and should be seen exuding, as it were, from between the ribs on the inside. A thickness of fat should also exist on the swell of the shoulders.

The fat of sheep should *always* be of a clear white colour, and should be abundant without being excessive. A sheep will not be too fat as long as the blue tinge of the lean can be seen outside the carcase at the shoulder-blades.

Kidney fat should be plentiful, and this, as well as the general condition of the carcase, can be ascertained by dividing the hind quarters at the loins. The legs should be short and plump, and the meat should extend well down to the hock. Different breeds will, however, vary in this respect, and it may be remarked that the heavier description, such as Leicesters and Cotswolds, are not nearly so profitable for troops as the smaller breeds, such as the Down and small Welsh, and amongst foreign sheep the merinos.

In oxen the exposed piece of meat where the quarters have been separated should show a margin of fat, and in the case of stall-fed animals in good condition the muscles will be found streaked with fat.

It is not likely that high-class stall-fed cattle, such as are seen at our Christmas shows, will ever be supplied by the contractor for issue to troops, and even were this probable, such meat would be unprofitable; for although up to a certain point the fattening process tends to increase the nutritive value of the meat, if this is carried to an extreme an actual waste is incurred, from the fact of the fat being so much in excess of the lean. On the other hand, the flesh of animals in poor condition is more or less deficient in nutritive value, and, moreover, the amount of bone is relatively in too great a proportion. In both beef and mutton the bone should not be in excess of 20 per cent. of the meat.

As regards the quality of the flesh, we shall find that this depends a good deal upon the animal's age and condition, and the part of the body from which it has been cut.

I have already alluded to the subject of age, so that we will now proceed to consider the general characteristic appearances of good meat.

The flesh should be firm and elastic, adhering tightly to the bones, of a bright-red colour, possessing an agreeable odour, and should be marbled with fat.

What may be termed a second quality of meat, good, wholesome, and fit for issue, will present very much the appearance just described, with the exception of the fatty streaks, which may be present in a lesser degree, or altogether absent, depending upon the fattening quality or age of the animal.

In very young animals the flesh is pale and moist, and in old beasts it is darker in colour.

Although freshly-cut meat of prime quality should not yield any serum or watery fluid, we shall find that if placed upon a white dish, a small quantity of reddish juice, of a fresh pleasant odour will exude from it.

The best joints to examine in order to ascertain the quality of beef are the "rib cut" and "sirloin."

In cutting across the muscles there should be no appearance of lividity, the interior should be of the same character or a little paler.

The marrow of the long bones is of a solid character, but is slightly softer in the fore limbs; it should be of a dull red colour, and free from stains or dark patches.

Meat of inferior or bad quality is characterised by certain appearances depending upon a variety of causes.

A deep livid or purple colour is indicative of an animal having died a natural death, and is due to the blood being retained in the veins. In these cases we also frequently find that the tissues are stained by effusions. The meat has a dull aspect, and frequently an unpleasant odour; it will be found to have lost its elasticity, and to have become soft, flabby, and damp from accumulation of serum.

To examine the flesh in this condition properly deep incisions should be made, when the peculiar appearances can be the more readily ascertained, and moreover it will be noticed that blood will exude from the cut portion, and that the meat will stain the hands deeply. The fat in these cases will probably present a soft, damp appearance.

Such flesh should of course be at once rejected, for although we have no actual evidence to show that it is prejudicial to health, it cannot be considered as wholesome meat, and soon decomposes.

I have already mentioned that a dark red hue in meat is a symptom of age, but when this dark colour is associated with a strong odour, and probably with effusions of blood into the muscular tissue, it is also a sign that the animal has been overdriven.

Overdriving, and the fatigue of long journeys frequently produce inflammation of muscular tissue, and in many cases the appearances of the carcase closely resemble those described under the head of Anthrax. Such meat soon putrefies, and although not absolutely injurious should be rejected as unfit for food.

When the process known as decomposition has commenced, we shall find the flesh becomes paler in colour, and loses the characteristic elasticity and odour of prime meat. The further symptoms of putrefaction are readily recognised and are marked by a greenish hue, a disagreeable odour, and increasing softness.

The practice of pushing a knife up to the hilt into suspected flesh is a good one. If the meat is sound resistance will be uniform, if it be undergoing decomposition some parts will be found to be softer than others, and the blade of the knife will have an unpleasant smell.

Decomposition takes place more rapidly near the bones. Of course such meat is utterly unfit for food, and must be rejected under all circumstances. Its consumption has been followed by serious consequences, such as putrid fevers, bowel complaints, etc. Putrid meat, especially pork, is frequently attempted to be passed off by sprinkling it with deodorizing compounds, such as carbolic acid or creosote.

There is no doubt that a large trade in decomposed flesh is carried on in spite of the legislation on the subject, and that tons of such meat are annually salted, spiced, and made up into sausages. Meat "just on the turn" is frequently placed in the pickle tub. It may be detected by bubbles of gas coming to the surface, by its greenish colour, and nauseous smell.

In the case of animals slaughtered whilst suffering from an emaciating disease, we shall find an unusual paleness of the flesh which adheres but slightly to the bones. It will have a sickly smell, which is more observable during the process of cooking.

Fly-blown meat need not be described, as the appearances are so well known. It is unfit for food.

Meat infested with parasites has already been referred to, and need not be further described. It is known to be highly injurious to the consumer under certain circumstances.

We may sum up this portion of our subject by the following extracts from Dr. Letheby's "Lectures on Food":—

1st. Good meat is neither of a pale pink colour nor of a deep purple tint, for the former is a sign of disease, and the latter indicates that the animal has not been slaughtered, but has died with the blood in it, or has suffered from acute fever.

2nd. It has a marbled appearance, from the ramifications of little veins of fat among the muscles.

3rd. It should be firm and elastic to the touch, and should scarcely moisten the fingers; bad meat being wet, and sodden, and flabby, with the fat looking like jelly, or wet parchment.

4th. It should have little or no odour, and the odour should not be disagreeable, for diseased meat has a sickly, cadaverous smell, and sometimes a smell of physic. This is very discoverable when the meat is chopped up and drenched with warm water.

5th. It should not shrink or waste much in cooking.

6th. It should not run to water or become very wet on standing for a day or so, but should, on the contrary, be dry upon the surface.

7th. When dried at a temperature of 212° or thereabouts, it should not lose more than 70 to 74 per cent. of its weight, whereas bad meat will often lose as much as 80 per cent.

To this it may be added that there should be no sign of the presence of parasites.

The fat also should neither be deficient nor excessive.

(*To be continued.*)

THE NATURAL HISTORY OF THE LIVER-FLUKE AND THE PREVENTION OF ROT.*

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LIVER-ROT, although so destructive a disease, is a preventable one.

The object of the present paper is to give a popular account of the results of a research into the natural history of the parasite which causes the Liver-rot of the sheep and a number of other animals. This research, which has now been completed, was undertaken by me, on behalf of the Royal Agricultural Society of England, in June, 1880; and the progress of the investigation has been already reported in two papers† contributed to the "Journal" of the Society. A short account of the completed research appeared in *Nature* for October 19th, 1882, and a detailed account intended for scientific readers was published in the *Quarterly Journal of*

* From the *Journal of the Royal Agricultural Society*, No. 28.

† "Report of Experiments on the Development of the Liver-fluke," vol. xvii., 1881. April, p. 1; Second Report, vol. xviii., 1882, October, p. 439.

Microscopical Science, for January, 1883. To this last-named paper I may refer any reader who desires to learn the details of the development of the Liver-fluke. The present paper is only intended to give the outlines of the life-history of the fluke in such a way as to enable the farmer and the general reader interested in agricultural matters to understand how the parasite is propagated through successive generations, how the sheep incurs the disease by taking in the young fluke with its food, and, lastly, the various methods of preventing the spread of so destructive a disease. Technical terms will therefore be purposely avoided.

For the sake of convenience, the subject is divided into the following parts :—

I.—Nature of the Disease.
II.—Life-history of the Liver-fluke.
III.—Prevention of the Rot.

Part I.—Nature of the Disease.

The Rot, Liver-rot, Fluke disease, Coathe, or Bane, are all names given to one and the same disease. It is sometimes known as the Sheep-rot, since amongst our domesticated animals the sheep is by far the most frequent victim. Very many other animals that eat grass or herbs are, however, subject to the disease, including cattle, deer, horses, pigs, rabbits, hares, kangaroos, camels, etc. ; and even man himself is occasionally attacked.

Liver-rot has been known and dreaded from very early times ; it was so well known in Shakspeare's day that an allusion to it occurs in his writings. It is unnecessary for me to enter here into a history of the disease ; for this I may refer to Professor Simonds's paper.*

Many theories have been suggested as to the cause of the disease, several of them being very far from the truth. It is really a parasitic disease, and is caused by the presence, in the bile-ducts of the liver of the diseased animal, of large numbers of flat worms, known as the Liver-fluke (called by zoologists *Fasciola hepatica*, or less correctly, *Distoma hepaticum*). The Liver-fluke has the shape of a privet-leaf, or of a small sole ; it is pale brown or of a flesh-colour, and is about an inch or an inch and a third in length, and in breadth about half its own length. At one end is a narrower projecting portion, which may be compared to the short, thick stem of the leaf ; this is the head-part, and at its tip is placed the mouth in the middle of a small sucker or sucking-cap, by which the fluke can attach itself. At the point where the head joins the flat body and on the lower surface is a second sucker—the ventral sucker.

The Liver-rot caused by these flukes is always common in certain districts of England, and it has been estimated that the average annual loss of sheep in the United Kingdom amounts to no less than 1,000,000. The rot also occurs almost all over the world, extending to Egypt, Australia, Tasmania, and North and South America, and is nearly, or sometimes quite, as destructive in these countries as in the British Isles. Professor Leuckart estimates the average loss per annum in Central Europe alone at 1,000,000 head.

But a series of wet seasons always increases the prevalence of the disease. At such times it spreads to districts which are ordinarily quite free from it. The year 1879 was one of a succession of wet seasons, and the losses during the end of that year and the following spring amounted to no less than 3,000,000 sheep. In his report to the *Journal of the Royal Agricultural Society*,† Mr. Finlay Dun estimates that the same number of sheep died or

* "The Rot in Sheep." London, John Murray, 1880. See also *Journal of the Royal Agricultural Society*, Second Series, vol. xvi., part 1, 1880, p. 121.
† Second Series, vol. xvii. p. 141.

were sacrificed from rot during the following year. As this is equivalent to the loss during each year of about one-tenth of the total number of the sheep in the United Kingdom, and represents the loss of six or eight millions sterling* per annum, the serious nature of the epidemic will be only too readily seen. Such a loss would be most grievous at any time, but was especially so at a time of bad seasons and widespread agricultural depression.

A portion of the loss falls of course upon the consumer, as is shown by the increase in the price of mutton. Futhermore, the quality of a portion of the supply which comes to the market is necessarily poor.

When the disease had spread so widely and had become so exceedingly destructive, it was doubly necessary that we should bestir ourselves and try all preventive means.

But what were the right measures of prevention? Here, unfortunately, was the great difficulty. Nothing exact had been found out as to the way in which the fluke entered the sheep, and we had to contend against an insidious enemy who was invisible to us, to strike blindly and in the dark.

In this state of uncertainty it was a matter of national importance that the whole question should be investigated, in order that it might, if possible, be discovered what were the proper preventive measures to be employed. The Council of the Royal Agricultural Society therefore provided the funds needful to procure costly but indispensable apparatus and material. The investigation thus originated began in the summer of 1880, and was brought to a successful close in the autumn of 1882.

What was really known in 1880 came very briefly to the following. The Liver-rot was a parasitic disease due to the presence in the bile-ducts of the livers of the diseased animals of great numbers of Liver-flukes. Animals were liable to contract the rot when allowed to graze on low-lying, wet, or ill-drained lands, and especially on grounds subject to floods.

So much was clearly proved. In addition, it was believed by men of science, from what was known of the animals most nearly related to the Liver-fluke, that there were larval forms inhabiting some snail or slug, and that the larvæ were subsequently taken up by the sheep when grazing. Some had suggested water-snails, other land-snails or slugs, and numerous attempts to solve the question had been made by various eminent zoologists; but all had proved fruitless, and, notwithstanding its great practical importance, the problem remained unsolved.

Now, however, the mystery has been cleared up, and I will proceed to explain it in order, step by step, so that I may afterwards show how and where preventive measures are to be applied.

Part II.—The Life-history of the Liver-fluke.

Before giving the life-history of the Liver-fluke, it will be well for me to explain a wonderful peculiarity in the manner of the multiplication and spread of the animals belonging to the group of flat-worms of which the Liver-fluke is a member. The fully-grown adults live as parasites in some kind or other of backboned animal, such as a sheep, and thereby multiply by producing eggs. Each of the eggs gives rise to an animal, which is never like its parent, never does become like it, and never lives where its parent lives. It enters some snail or slug, and there grows and multiplies, not in the common way by producing eggs, but by giving rise to germs within itself. Calling the animal which is hatched out of the egg the first generation, these germs will form the second. There may be a third and

* It is very difficult to ascertain the real loss in money, as rotten sheep are frequently sold for food, though at a considerable loss. But in very many instances the animals were sold merely for the price of the skins.

a fourth, or even more, generations in the snails, all these arising in the same way as germs; but at length a form arises which is destined to leave the snail in some way or other, to be swallowed by the backboned animal with its food, then grow much in size, become adult, and reproduce itself by eggs.

The snail or slug which harbours the first, second, and following generations is called the intermediate host, the backboned animal being the ultimate or final host, and there is thus a constant alternation of one generation living its adult life in the backboned animal, and of one or more generations in the snail or slug. This is an example of what naturalists call an *alternation of generations.*

In the case of the Liver-fluke there are at least two generations which live the whole of their adult lives in the particular snail which has now been clearly proved to serve as the intermediate host of the fluke. The third generation arises as a germ in the snail, and whilst still a minute larva passes in the manner explained below into the sheep. That is to say, supposing we start with the fluke as it is found in the sheep, its child does not grow up into an animal like the parent, nor does the grandchild do so. Both child and grandchild look very different from the true Liver-fluke, and live in the snail; but the great-grandchild, forming the third generation, does, as a rule, grow up into a true Liver-fluke and live in the sheep.

Wonderful as this may seem to any one who has not studied the marvels of animal life, the fact of alternate generation has been established beyond all doubt, not merely for the Liver-fluke, but also for numerous other forms of life, which, however, do not at present concern us.

The Eggs of the Liver-fluke.—The adult fluke, whilst living in the bile-ducts of the sheep or other rotten animal, produces vast numbers of eggs. The bile-ducts (popularly known as the *pipes*) become large, and their walls thick, owing to the presence of the parasites. The bile contains numbers of eggs too small to be separately recognised by the naked eye, but which are nevertheless present in such quantities that they give it a dark colour. In some of the small ducts where the eggs have not been washed away by the bile, they may be present in such enormous numbers as to form a stiff dark-brown mass, looking like fine wet sand, and completely blocking up the inside of the duct.

The eggs are very minute indeed, being only $\frac{1}{200}$th of an inch in length; but this may be rendered visible to the naked eye by placing some of the dark-brown contents of the bile-ducts into a glass vessel with water and shaking it up. On now holding the vessel up to the light, the tiny eggs will be seen as brownish specks suspended in the water. If they are very numerous, they will colour the water a light-brown, or may even give it a dark coffee-colour. They are a little heavier than water, so that if the vessel is allowed to stand for an hour or two all the eggs will fall to the bottom, and leave the water colourless.

The number of eggs produced by each fluke is very large, and its fertility has been underrated. In one case I obtained 7,000,000 eggs from the gall-bladder of a single sheep suffering from the rot, and as the liver contained about 200 flukes, this gives an average of 37,000 eggs to each fluke. And these eggs were found in the gall-bladder alone; the liver must have contained at least as many more, and eggs had been passed copiously by the sheep for many months. The number of eggs produced by a single fluke may be safely estimated at half a million, a number more easily spoken of than realised.

It is very important that we should know more about the egg, for it forms the starting-point of new generations. But to know more about the egg, it is necessary to see it highly magnified by means of the microscope. Figure 1

shows an egg thus seen. It is an oval body, with a transparent shell, which allows the contents to be distinguished. One end is a little rounder and blunter than the other, and shows a line marking off a rounded portion which forms a lid to the rest of the shell. A little below the lid is a small round mass, which is the present condition of the first generation or animal which will ultimately be developed from the egg. The remaining contents of the egg are simply a store of food for the benefit of this animal.

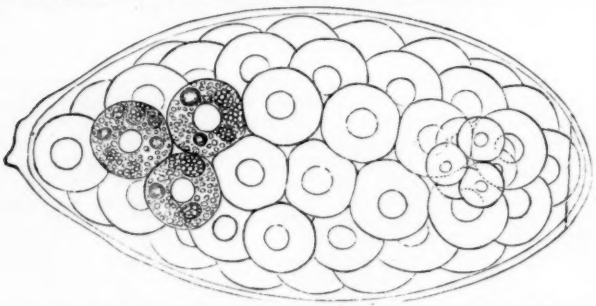


FIG. 1.—Egg of the Liver-fluke examined shortly after it was taken from the liver of a sheep. At the right-hand end of the shell may be seen the line marking off the lid, and a little to the left, the embryo in a very early stage of development. The embryo is surrounded by round masses which serve as food; they are all of them granular, but only three at the left-hand side have been fully drawn. Magnified 680 times. (Original.—A. P. T.)

So long as the egg remains within the body of the sheep no further change takes place.

Under natural conditions, however, the eggs of the fluke are washed away by the bile into the intestine, and, passing through the intestine uninjured, are at length distributed wherever the droppings of the infected animals fall. If they fall on to wet or marshy ground, or are washed by rain into ditches, ponds, or brooks, further changes occur, and in each egg is formed the first generation or animal, which we may term the *embryo*, so long as it is in the young condition.

Not only moisture, but also a certain degree of warmth is required for the growth of the embryo within the egg. A temperature of about 74° to 78° Fahr. is the most favourable, and then the embryo is formed in about two or three weeks; with less warmth, progress is slower, and with an average temperature of 60° the growth occupies two or three months. Whilst the temperature is very much below this, as in winter-time, the egg does not change at all. It will be seen, therefore, that the embryo will not hatch out in the winter-time, and that eggs which fall into suitable places at this season will only be hatched out as the warm weather comes on at the end of spring or beginning of summer.

But all eggs do not hatch out in the same time; a certain number are hatched out on every successive day for some weeks or even months, and at the end of this time some of the eggs may remain in the same condition as when just taken from the liver. No explanation can be found in the eggs themselves of the very variable time required for the growth of the embryo, but the fact is of much practical importance, for *eggs scattered over any damp ground may render it dangerous for a long period.*

Figure 2 shows a fluke-egg at the time when the embryo is fully formed within the shell and is ready to hatch out. The embryo lies curved on itself

at one side of the egg, and on the other side are the remains of the food with which it was originally provided. The head-end of the embryo is directed towards the end of the egg which has the lid; and between the lid and between the embryo and the lid is a cushion or pad of stiff jelly-like substance. It will be seen that the surface of the body is covered with what look like hairs (still more plainly seen in the free embryo, Fig. 3). They are not really hairs, but can be moved; they are known as cilia, and it is by their means that the embryo swims, for they act as so many paddles in propelling it through the water.

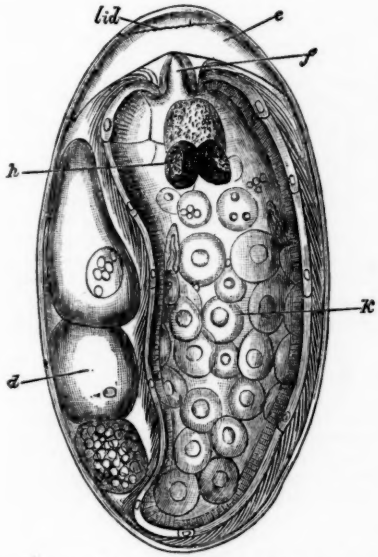


FIG. 2.—Egg of the fluke containing an embryo ready to hatch out: *d*, remains of food; *e*, a cushion of jelly-like substance; *f*, boring-tool of the embryo; *h*, eye-spots; *k*, germinal cells. Magnified 680 times. (Original.—A. P. T.)

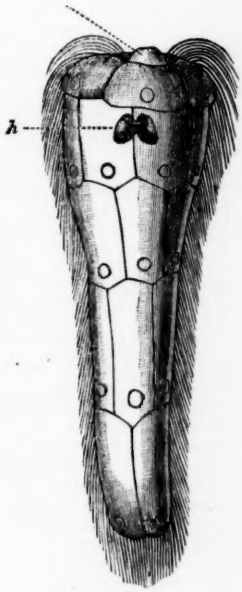


FIG. 3.—An embryo as it appears when swimming in the water; *f*, boring-tool; *h*, eye-spots. Magnified 500 times. (Original.—A. P. T.)

Let us watch the embryo as it hatches out. It moves within the egg, the movements becoming more marked, until at last, the body being stretched out suddenly to its full length, so much pressure is brought to bear against the lid that it flies open as if moved by a spring. The cushion of jelly-like substance pours out, the embryo thrusts the forepart of its body out of the shell, the cilia (or paddles) begin to move as soon as the water touches them, and the animal, after a short struggle, succeeds in drawing the whole of its body through the narrow opening of the shell, and glides away with ease and rapidity through the water.

Figure 3 shows the embryo as it appears when swimming freely through the water. This figure is of course very highly magnified; its real size is so

minute that it can only just be detected by the naked eye, even under the most favourable circumstances. It has a conical shape—that is to say, it is not unlike a sugar-loaf in form—and it is about $\frac{1}{100}$th of an inch in length. The broader end is always directed forwards, and in its centre is a short peg-like projection, which is used as a boring-tool, and can either be drawn in or thrust out. The whole surface of the animal, with the exception of the projection just mentioned, is covered with the long hair-like paddles or cilia, by means of which it swims, with the boring-tool drawn in, swiftly and restlessly through the water. It is exceedingly interesting to watch it speeding through the water; it is wonderfully active; sometimes it goes rapidly forwards, revolving upon itself like a top, just twisting a little from side to side, as if searching for something. At other times, by curving its body, it sweeps round in circles, or, curving itself yet more, spins round and round the same spot, without moving from it.

Towards the front end of the embryo are two black marks (Fig. 3, *h*); they have the shape of two half-moons placed back to back. These are very simple eyes, and though they cannot give the embryo the power of seeing very distinctly, yet they render it very sensitive to light, and are no doubt of very much help to it in searching for its new home.

When the embryo, in moving through the water, comes in contact with any object, it pauses for a moment, and feels about, as if trying to discover its nature; and if not satisfied, it darts off hastily again. But if the object be the particular kind of water-snail known as *Limnæus truncatulus*, it at once tries to bore into it. This snail is a very common one; but it is so small that it usually escapes notice, and hence it has no common or popular name. More will be said about it further on. Under ordinary circumstances, the boring-tool in the head of the embryo (*f*, Fig. 3) is short and blunt, but as soon as the animal begins to bore, it becomes longer and more pointed. The embryo spins round and round on itself, just as the handle of a gimlet is turned, the hair-like paddles working vigorously, and pressing the little embryo against the surface of the snail. The pressure is increased by the body of the embryo being alternately drawn together and then suddenly stretched out. As the boring-tool sinks further into the substance of the snail it becomes longer and longer, until at length it reaches five times its original length (see Fig. 4), and the substance of the snail is forced apart as if by a wedge; and a gap is thus made through which the embryo squeezes its way into the snail.

Figure 4 shows the embryo whilst in the act of boring into a snail; only a very small portion of the snail's body has been drawn.

It may be interesting for me to state briefly how the further development of the embryo within the snail was traced. Very large quantities of eggs were collected from the livers of rotten sheep, and hatched out in water. The embryos were then transferred to vessels of water containing many different kinds of snails, and their behaviour watched. When it was discovered that the embryos bored into the particular kind of snail called *Limnæus truncatulus*, large numbers of this kind were got. Embryos of the Liver-fluke were allowed to bore their way into them, and then they were dissected at definite intervals—some three, six, or twelve hours later, others on each successive day, until the whole history was traced. In this way the changes passed through by the animals found in the snail could be followed step by step, and the relation of the different generations proved beyond any possibility of doubt.

The embryo of the Liver-fluke will not bore into all snails alike; the only other kind of snail into which I have found it enter at all is the one called *Limnæus pereger*. But it is only into the very youngest and smallest snails of this kind that the embryo will force its way, and even these do not afford

a suitable place for its further growth, for every embryo that succeeds in entering, perishes at an early stage.

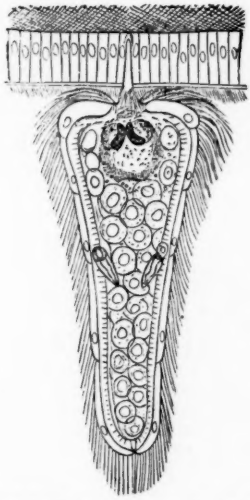
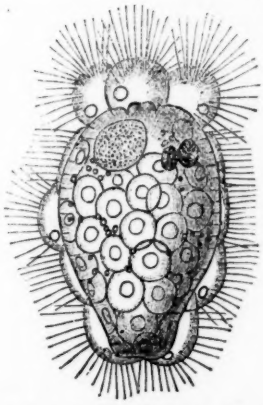


FIG. 4.—Embryo of Liver-fluke boring into a snail. Only a very small part of the snail has been drawn. Magnified 370 times. (Original.—A. P. T.)



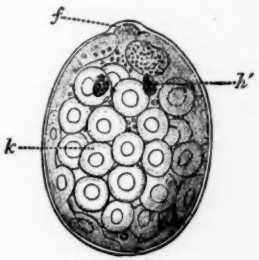


FIG. 5, on the left, shows the change of the embryo into sporocyst just after it has entered the snail. Fig. 6, on the right, shows a young sporocyst produced by the change of the embryo: *f*, boring-tool; *h'*, eye-spots disappearing; *k*, germinal cells. Magnified 500 times. (Original.—A. P. T.)

The embryo seems to know by instinct the right kind of snail. Thus I have placed large numbers of freshly-hatched embryos in a small vessel of water containing *Limnæus truncatulus* and several other kinds of fresh-water snails; and on subsequently examining them all, have found the specimens of *Limnæus truncatulus* to contain as many as fifty or more fluke-embryos each, whilst the other kinds of snails were entirely free from them.

The natural place for the further growth of the embryo is either in or near the lung of the snail. Once safely lodged in the suitable position, the embryo undergoes a great change of form. It is now settling down to a sluggish parasitic life. It no longer needs the paddles to propel it through the water, and they are therefore thrown off. It no longer needs eyes to help it to find its way about, for it scarcely stirs in the snail, and so they get indistinct, and may at length be altogether lost. The form of the body is also changed, and, instead of being like a sugar-loaf in shape, it becomes oval.

Figure 5 shows the animal whilst the change is taking place. Figure 6 shows it as soon as the change is completed. We need a name by which to distinguish this first generation in the snail, and so will call it by its English name *sporocyst*, which simply means a bag of germs. This is literally what it becomes as it grows inside the snail, its host. It lives entirely at the expense of the juices of the snail, and the rapidity of its growth depends upon the warmth of the season. In ordinary July weather it will reach its full length of $\frac{1}{10}$th of an inch by the end of the first fortnight. In colder weather, however, growth is much slower; and in winter-time very little progress is made, even in three or four months.

Figure 8 shows a full-grown sporocyst; it contains about half a dozen germs of different sizes. They are round at first, then they get longer, and finally take the outward shape of a sack. At the lower part of the figure is one which is just ready to hatch out, lying with its head directed downwards. This belongs to the second generation; it will be seen that it is different from the sporocyst, and it is called a *redia*, after the celebrated anatomist Redi. As soon as the young redia is ready to leave, it breaks its way through the wall of the parent; the wound formed by its forcing its way through immediately closes up, and the remaining germs continue to grow. In this way each sporocyst produces about half a score of rediæ. But there is yet another way in which the sporocyst multiplies, namely, by the division of one sporocyst into two across the middle, as shown in Fig. 7. This is worthy of mention here, as it causes a still greater increase in the number of the parasites within the snail.

Let us return to the rediæ which compose the second generation. Figs. 9 and 10 (p. 280) show two free rediæ; the former is nearly half grown, and the latter is adult. The rediæ are much more active than their parents, and migrate from the lung into the other organs of the snail, and particularly into the liver, upon which they feed. A redia differs from a sporocyst, its parent, in several points. The most important difference is that the former has a mouth and an intestine (Fig. 10, *in'*) shaped like a bottle, whereas the sporocyst has none. Its habits are more active; towards its hind end are two small projections (Fig. 10, *r*), which serve as legs of a very simple kind, and prevent the animal from slipping backwards as it moves through the body of its host.

If an infected snail which has a clean and transparent shell be chosen, the rediæ may be watched by the aid of the microscope as they move inside the living snail.

In forcing their way through the body of the snail the parasites necessarily do a great deal of harm; so much, indeed, that in my experiments in the laboratory I found very few snails live many weeks after infection. In fact,

the Fluke-disease is, in the laboratory at least, more destructive to the snail than it is to the sheep.

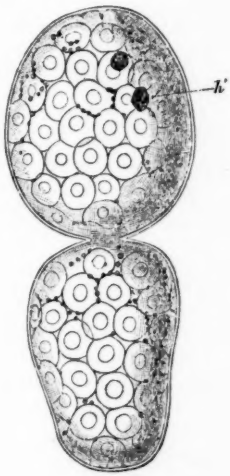


FIG. 7.—A young sporocyst dividing into two: *h'*, eye-spots disappearing. Magnified 500 times. (Original.—A. P. T.)

FIG. 8.—A full-grown sporocyst (the first generation) of the Liver-fluke. It contains several germs in different stages of growth. The largest, at the lower end, has assumed the characters of a redia. Magnified 230 times. (Original.—A. P. T.)

Within the redia are found germs, the third generation, which at first are very like those produced in the sporocyst. But later on we see that each germ becomes an animal shaped like a tadpole, with a flat, oval body and long slender tail. This animal is usually called a *cercaria*, the name simply meaning that the animal has a tail.

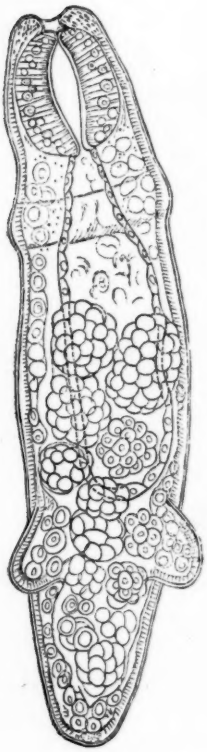


FIG. 9.—A young redia (second generation) of the Liver-fluke, with the contents forming into germs of the third generation. Magnified 230 times. (Original.—A. P. T.)

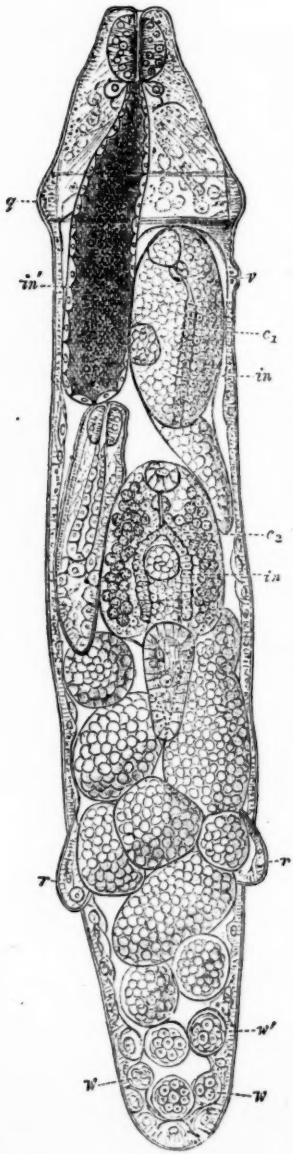


FIG. 10.—A full-grown redia (second generation) of the Liver-fluke. It contains a large number of germs of the third generation. Two of these are so far advanced that they show the characters of the tailed larva or cercaria. It contains also on the left hand a young redia. c^1 and c^2, the two cercariæ; *in*, intestine of cercaria; *w*, w^1, germs in a very early stage; *in'*, the intestine of redia; *r*, the birth-opening by which the cercariæ leave. Magnified 120 times. (Original.—A. P. T.)

An adult redia, such as is shown in Fig. 16 (p. 284), may grow to the length of one-sixteenth of an inch. It contains about a score of germs in all the different stages of growth; there are usually two or three so far advanced that they have become tadpole-shaped, and are ready to come forth. They escape from the parent by a special opening (*v*. Fig. 10), and then crawl or wriggle their way out of the snail.

Now these tadpole-like animals are destined to enter the sheep and there become true Liver-flukes, and I shall have to show how they get inside it.

FIG. 11.—A free cercaria (third generation) of the Liver-fluke as it is seen when swimming in the water; *y*, *y*^{1}, the two suckers corresponding to the suckers of the adult fluke; *in*, intestine; *cy*, the rounded masses at the sides of the body which provide the material for the formation of the cyst of envelope. Magnified 160 times. (Original.—A. P. T.)

When the snails infested with the above-described forms of the Liver-fluke are kept in an aquarium, the cercariæ or tadpole-shaped larvæ may occasionally be found swimming about in the water in a very lively manner. Fig. 11 shows a free cercaria as it appears when swimming. It has

a flat, oval body about $\frac{1}{50}$th of an inch in length, with a tail more than twice as long. There are two suckers (*y* and *y'*) corresponding to those of the adult fluke, and at the sides of the body are many granules arranged in rounded masses (*cy*).

The free-swimming life of the cercaria never seems to last long, for on coming in contact with the sides of the aquarium or the water-plants contained in it, the little animal soon comes to rest, draws its body up into a round ball, and exudes from the whole of its surface a gummy substance containing many granules (see Fig. 12), which are the same as those already described as forming masses at the sides of the body of the free cercaria. The tail meanwhile is wagged violently, and before long a more vigorous movement throws it off altogether. The gummy substance hardens on exposure, and the body of the cercaria is thus enclosed in an envelope which protects it from injury.

These envelopes are termed cysts (the word cyst meaning a bladder). They are snowy-white, and numbers of them may be found adhering to the walls of the aquarium in which the infected snails are kept, or attached to the dark-green leaves of the water-plants.

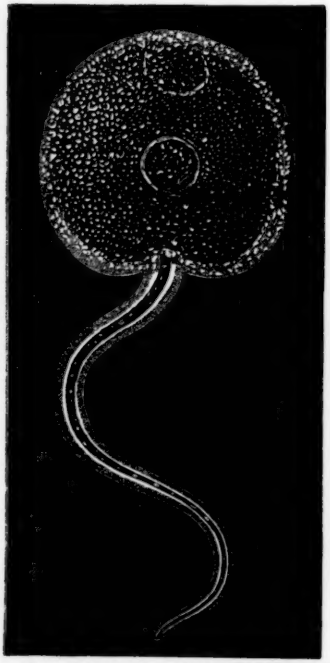


FIG. 12.—A cercaria in the act of forming its cyst or envelope. Magnified 160 times. (Original.—A. P. T.)

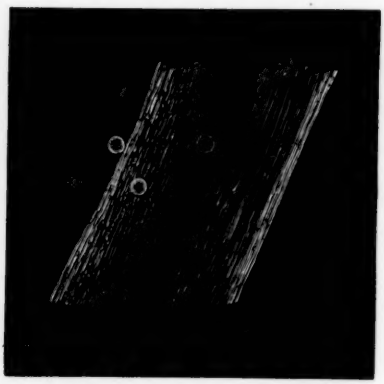


FIG. 13.—Three cysts of the Liver-fluke attached to a portion of grass-stalk. Each cyst contains a young fluke which remains quiet until the cysts are swallowed with the grass by a sheep when grazing. Magnified 10 times. (Original.—W. H. J.)

If the snails are crawling on the margin of a ditch or over a damp field, the cercariæ on leaving the snail at once proceed to form their envelopes or cysts at the bottom of the grass, and so attach themselves to the stalks or leaves near the roots.

Fig. 12 shows a cercaria in the act of forming its cyst, and Fig. 13, which is less highly magnified, shows three fully-formed cysts adhering to a portion of a grass-stalk. As even the latter figure is magnified to ten times the actual size of the object, the minute size of the cysts will be easily appreciated. They are really only one-hundredth of an inch across.

These cysts are the form in which the Liver-fluke is swallowed by the sheep, and the animals within them are young flukes. They remain adherent to the grass until the time comes when they are picked up by the sheep feeding on the ground. They may be compared to the pupæ or chrysalides of insects. It must, however, be remembered that whilst the perfect animals emerge from the chrysalides of insects of their own accord as soon as they are ready to do so, and live a free-winged existence, the animals will only come forth from the cysts of the Liver-fluke when the grass or plant to which they were attached has been swallowed by some sheep or other suitable animal. If the cysts are not so swallowed within a few weeks, the young flukes which they contain will perish.

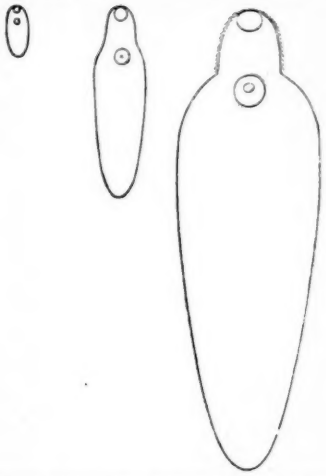
The number of cercariæ descended from a single fluke-egg cannot be less than 200, and is sometimes much larger. For the rediæ forming the second generation, instead of producing cercariæ, may, and perhaps as a rule do, give rise to another generation of daughter-rediæ resembling themselves, and these then produce cercariæ. When this is the case, a single fluke-egg may give rise to more than a thousand cercariæ. It will be seen, therefore, that not only does the race of the Liver-fluke multiply and increase abundantly in the sheep by producing myriads of eggs, but that there is a further and great increase of the forms within the snail. If only the greatest degree of ordinary increase was reached, a single fluke might give rise to more than a hundred million descendants in the next generation, of Liver-flukes proper, inhabiting the sheep. But, fortunately for farmers, the chances are enormously against any such disastrous increase.

The Habits of Limnæus Truncatulus.—The habits of the snail *Limnæus truncatulus*, which serves as an intermediate host, are of much importance, for they show how the snail is likely to become infected with the larval forms of the Liver-fluke, and also how the cysts are distributed in places where they have a good chance of being picked up by the sheep.

Limnæus truncatulus is a fresh-water snail, with a brown spiral shell; it is very common, and has a very wide distribution over the world. It is very small, its shell never reaching more than half an inch in length, whilst it is usually much smaller, a common variety in England scarcely ever measuring so much as a quarter of an inch. Owing to its small size it often escapes notice, or is taken for the young of some other kind of snail, so that it has no popular name. Two or three of the kinds of snails most closely allied to *L. truncatulus* (for instance, *Limnæus peregeri*) may occasionally crawl out of the water for short distances; but in *Limnæus truncatulus* itself the habit is so strongly developed that the snail should be termed amphibious. Indeed, it is oftener found out of the water than in it. When kept in an aquarium it quits the water, and as often as it is put back, insists on crawling out again, so long as the necessary strength remains. It is said to breed upon the mud of the banks of ditches. Although so common, it is often very difficult to find, no doubt owing to its minute size and its habit of wandering from the water.

As showing how much this snail lives out of the water, it may be interest-

ing to give my own observations. I have related in a former paper that I was quite unable in 1881 to get *Limnæus truncatulus* for my experiments, nor did I succeed in doing so until July of the following year, when there were floods on the river Isis near Oxford. The waters brought this snail down in vast multitudes, probably from its breeding-haunts in marshy places up the river. It was extremely abundant—so numerous, indeed, that a single sweep of small hand-net repeatedly gave more than 500 examples, and this was in a ditch where the year before I could not obtain a single *L. truncatulus*. All along the margins of the ditches the ground was covered by them, and they were found abundantly on the flooded ground.



FIGS. 14, 15, 16.—Three young flukes from the liver of a sheep to show the change in form during growth. All are magnified 7½ times. **Fig. 14** (on the left) represents the smallest fluke I have ever found in a sheep; it was only $\frac{1}{70}$ of an inch in length. **Fig. 15** (in the centre) shows the shape of a fluke $\frac{1}{8}$ of an inch long, and **Fig. 16** (on the right) shows a fluke which has reached $\frac{1}{3}$ of the full length of the adult animal. (Original.—A. P. T.)

On returning three weeks later to the same ditch I was unable to find a single example alive in the water. As I had not sufficient leisure on this visit to examine the ground near the ditch, I returned for the purpose of doing so eight days later. There had been dry weather since the flood, but early that morning heavy rain had fallen, and I found numbers of specimens of *L. truncatulus* on the gravel of a path near the ditch, and these seemed to have crawled out of the grass when revived by the rain. At the roots of the grass, all along the margin of the ditch, others were found in abundance. Some few shells were quite empty, but the majority contained the dried remains of the snail, which had shrunk far back into the spire of the shell. Most of these appeared to be quite dead, but were, however, merely dormant, for on placing them in water the tissues imbibed moisture and assumed their natural bulk; and after a few hours the snails had regained their full activity, and were seemingly none the worse for their prolonged drying up.

To test the power of resisting drought possessed by the snail, I collected a number of specimens, and placed them in an open vessel on a shelf in a dry laboratory, in a position where the sun fell upon them for an hour or so daily. I found that rather more than half of them withstood twenty-six days of this treatment, and some few revived after more than six weeks. That the snails can live on moist ground, quite away from any quantity of water, for considerable periods is sufficiently proved by the fact that I have kept them alive for eleven weeks on moist grass and moss, even when infested with the larval forms of the Liver-fluke.

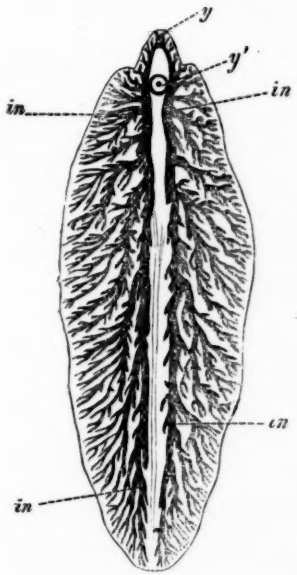


FIG. 17.—An adult fluke showing the branched digestive tract; *y*, the oral; *y'*, the ventral sucker; *in*, the branched intestine. In the centre, between the two main branches of the intestine, lies the chief trunk of the water-vessel. Twice the natural size. (Original.—W. H. J.)

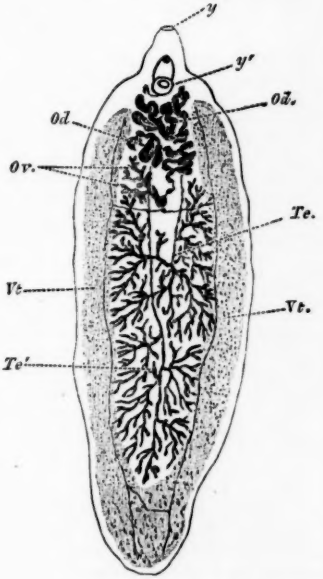


FIG. 18.—Another view of an adult fluke, showing the reproductive organs: *y*, the oral; *y'*, the ventral sucker; *Od*, the oviduct; *Ov*, the ovary; *Vt*, the vitellarium or gland that forms the granular yolk-cells surrounding the embryo in the egg; *Te*, the anterior; *Te'*, the posterior testis; their ducts run forwards. The generative opening is in front of the ventral sucker. Twice the natural size. (Original.—W. H. J.)

It is clear, therefore, that the kind of snail under consideration may be brought in great quantities by floods, and may be left on the fields when the waters pass away. The snails thus left continue to wander and feed, so long as the bottom of the grass remains moist. Their numbers are recruited from surrounding ditches and streams. Even on land

which is not liable to floods this snail may exist in large quantities, having crawled from the ditches, ponds, streams, and marshy spots through the the moist grass. A drought may render the snail dormant, but, unless continued too long, it revives at the first shower of rain.

(*To be continued.*)

Proceedings of Veterinary Medical Societies, &c.

SCOTTISH METROPOLITAN VETERINARY MEDICAL ASSOCIATION.

A QUARTERLY meeting of this Association was held in the London Hotel, Edinburgh, on Wednesday, August 22nd, the President, C. Philips, Esq., A.V.D., 3rd Dragoon Guards, in the chair.

Present—Professors Walley, Williams, Baird, and McQueen; Messrs. Borthwick, Black, Aitken, jun., Dalkeith; Boyd, Mitchell, Glasgow; Mitchell, Leith; Weir, Gray, Fairbairn, Maloney, Hepburn, Cunningham, Young, Aitken, jun., Edinburgh; Connachie, W. O. Williams, Pottie, Cameron; some visitors, the representatives of the press, and the Secretary.

Mr. Stewart, M.R.C.V.S., Stirling, was elected a member.

Veterinary Inspectors.

The SECRETARY (Mr. Rutherford) read a letter from Mr. Rolls, complaining as to a recent Order in Council by the Veterinary Department, which provided that any one registered as a practitioner under the Veterinary Surgeons Act might become a veterinary inspector, and Mr. Rolls asked the Association to protest against unqualified inspectors.

Principal WALLEY said he was afraid the Council would be averse to re-opening the question. Some time ago he wrote the secretary of the Veterinary Department with reference to one or two inspectors who were merely students, and had not been in the profession more than two or three years, and he was quietly told that the registration committee had finished their labours, and the whole thing was closed.

Another member corroborated Principal Walley's opinion, stating that he also had written on the subject, and was told that the Department saw no reason for re-opening the question. Any application they might make should be to the Privy Council, and not to any one connected with the Royal College of Veterinary Surgeons.

The CHAIRMAN suggested that they should delay consideration of the subject till next meeting, and this course was adopted.

Interesting Specimens.

Mr. BOYD, Melrose, exhibited a hook which he had invented for use in parturition.

Principal WALLEY brought under the notice of the meeting a case of fractured tibia with secondary displacement.

Subject: An aged three-parts bred mare, about fifteen hands high, a well-known trotter.

History: The animal had been going lame some little time prior to the day on which I saw her. On examination I found her lame in the near hind leg, the symptoms indicating Bone Spavin, which indeed existed, no other cause of lameness being apparent. An exostosis existed in the off

hock above the seat of spavin. I advised that both hocks be fired and blistered; the animal was sent into the College the following day, when, with a little trouble (as she was rather a bad-tempered mare), I fired the near hock, and proceeded to operate on the off.

I had only drawn the iron three times across the hock when the mare struggled to get the forefoot out of the grasp of the assistant; she succeeded in doing so, and in putting it to the ground picked up the near hind foot, and suspended the leg. I immediately noticed the gastrocnemii tendons coil and the leg swing inwards, indicating that some serious bony, muscular or tendinous lesion had taken place, and on manipulation oblique fracture of the tibia was at once diagnosed. I need not say that the occurrence staggered me for a moment, and I was puzzled to explain it, except on the theory of muscular contraction. Subsequent examination of the bone revealed the cause of the apparently spontaneous fracture; and you will see by the specimen that a partial fracture had taken place at least ten days before the displacement, as shown by the new ossific matter deposited in the posterior aspect of the bone adjacent to a longitudinal crack in its compact tissue. The struggling of the animal during the operation had completed the fracture.

At first sight it would appear remarkable that no evidence of the fracture existed when I first examined the leg. When, however, it is borne in mind that the seat of the injury was at the posterior and outer part of the bone, where large masses of muscle exist, all wonder on the point ceases.

Had the animal been cast for the operation, the fracture would, in all probability, have been completed earlier.

To young practitioners the case points a moral, viz., always carefully examine a bone under such circumstances with the view of discovering evidence of previous injury. Eighteen years ago a case of fractured tibia came under my notice, in which a mare did light ploughing for a fortnight before the displacement resulted.

The PRINCIPAL also exhibited a portion of the kidneys of a horse in which there was an abscess, although the animal when alive showed no indication of disease.

Mr. W. O. WILLIAMS showed specimens of actinomycosis and bacillus of Tuberculosis.

Castration of Rigs.

Mr. MITCHELL, Glasgow, read a paper on the castration of rigs, describing in detail the method he pursued, and giving practical hints for performing the operation. He said:—At the earnest solicitation of your most indefatigable secretary, Mr. Rutherford, whom I met in Glasgow last month, I was prevailed upon to come to this meeting here to-day, not for the purpose of giving an essay upon castration, as I presume that nearly all here present have read and discussed in their own minds the essay which I read before the West of Scotland Association in May, 1882, and which appeared in the pages of the VETERINARY JOURNAL and *Veterinarian* the month following; but rather to give a few practical hints and facts regarding the *modus operandi* of the operation. The first point for consideration is the method of performing the operation in the standing posture, and whether it is preferable. When this method was first adopted here I was very much impressed in favour of it, but with appliances, such as the rope-hobbles I have here with me, from Farmer Miles's pattern, I have now almost discarded the standing position altogether.

The first thing to be done in adopting this method is to get a corner where to place the animal. The ground should, if possible, be earthen, to prevent slipping. A ring and staple are driven into the wall about two feet from the ground and somewhat behind the forearm. A twitch being put on, the

rope is first put through the ring in the wall, till the eye catches on the under side; it is then brought over the neck in front of the withers, back through the eye and tightened; one man can hold twitch and rope, and another, placed at the haunch to steady him, are all the assistants required.

It is rarely any attempt to kick is made. If it should be attempted, by tying a piece of small rope on one hind leg at the hock, and twisting it till we meet the other leg, when it is firmly tied, the attempt will be entirely frustrated. After stroking the animal down, the scrotum is then grasped and made tense, when, with a couple of free incisions from before backwards, the testicles are liberated. The only two practicable methods for removing the testicles in this position are the clams or ecraseur. The clam, when used, should be fastened with a leather thimble, such as the one here shown, and if the ecraseur is used. I generally put both testicles through the chain at once, and having them evenly placed, the chain is pulled home, catching the cords, about an inch above the epididymis; the slack is speedily taken in, and the testicles drop off. No hemorrhage takes place, and no after-treatment is necessary, except the keeping open of the wounds and plenty of exercise.

I will now give you my reason for discarding this method. If I used the clam, which I do not approve of, I should most certainly uphold the standing position; but as I always preferred to operate by the ecraseur, I will state my objection to its being used. When the ecraseur is tightened (on one or both testicles, it is the same), the animal frequently crouches down; and before you get finished, he is either down upon his haunches or lying on the ground struggling, it may be with the ecraseur under him, when you have the danger of the cord being lacerated, or at least not easily got at for the purpose of accomplishing your object.

I will now say a few words on a subject of more importance, viz., Cryptorchids. Much has been said and written upon this subject of late, since the advent to this country of Farmer Miles, and I must say that I feel a little diffident upon entering upon it at the present. I wanted our friend Mr. Rutherford here, to wait till next year until I could give results more accurately, perhaps, upon this subject. However, I shall try and describe as nearly as possible the means of securing the animal and finding the missing testicle. The securing of the animal is a very intricate proceeding; the first thing to be done is to put on the ordinary side line, the loop over the neck and the lines passed round above the hock through the collar and left there until you get on the hobbles here shown. There are five used, the main one being placed on the near fore-foot, two on the off-fore, one round the pastern, and one above the fetlock, and one on both hind feet. The rope is passed from the near fore-foot, through the lower ring on the off-fore, through the off-hind from without towards you, and through the near-hind. It is again brought forward, and brought from without inwards through the upper ring on the off fore-leg. So far as I have described is the manner adopted in casting colts—except the side line. When pulled, the animal falls where standing, and you now begin to apply the side line; the near hind foot is first released from the hobbles, and the side-line put round the pastern; it is hitched and brought round the back until the leg is flexed as much as possible backwards; the rope is then brought up between the hind legs behind and again fastened; the animal is now turned, and the same done with the off one, the ropes crossing each other round the back and between the legs; the fore-feet are fastened by means of two small cords to the neck-rope. The spreader is then applied between the fetlock and hock, and assists very materially to keep the parts separate and steady. By this means the pelvic region is expanded to its fullest extent.

We now take a fold of skin in our hand over the seat of the inguinal

canal, and making it tense, the hook point of this knife is put through it, and the skin cut for about six inches. By using the two fore-fingers, an opening is made into the canal through the external ring, after which a little olive-oil will assist in making further progress. If the testicle be not embedded here in the ring, we must then gather our fingers into a cone-shape, and by a rotatory motion, an entrance to the canal is effected. You then work your way forwards towards the internal ring, and in the majority of cases will be successful in laying your hand upon the testicle; it will perhaps be small and devoid of coverings, or it may be enveloped loosely in the Tunica reflexa, so that you might imagine it was a portion of small intestine you had in your hand; after getting hold of it, with steady traction you will generally get it outside; if not, you can slip in the ecraseur and screw it off internally. But suppose you have not yet found the object of your search, you must proceed a little further still, until you can pass your fingers through the internal ring. Here it may be found floating in the abdomen; if not, by gliding your hand gently over the surface of the peritoneum, you will likely feel some slight swelling in its folds. Take the forefinger and puncture it over the swelling, and most likely you will find it to be the testicle floating at the end of your finger; if so, put another finger through and secure it; then bring it with you in the manner already described. As I said before, in the majority of instances the testicle is rudimentary in its proportions, but as you will see from this specimen which I have with me, which I found in a rig after death floating in the abdomen, it is not always so. Sometimes we may have this form, and no doubt it would be a very difficult matter to attempt the removal of a testicle such as this; last year, when I found this I would not have attempted it, but I think if I should meet with a case now that I would manage to overcome the difficulty attending it. I think, gentlemen, I have said enough on this subject at present, but hope, from the discussion which will ensue, or from some idea one or other of you may take home to think over hereafter, that in a short time Rig Castration will be as simple and easily performed as ordinary castration at present is.

Principal WALLEY strongly condemned the use of clams as barbarous. He had never seen a colt die from castration until he saw the caustic clam used.

Mr. CUNNINGHAM, Slateford, defended the use of clams as the best and safest method, and stated that there was no danger of hernia or of the intestines coming out, as seemed to be feared by some, if the operation was properly performed.

Principal WILLIAMS said he had observed pain in some cases where the caustic clam was used, but he thought it was caused more by a mistake in the operation than anything else. He objected, however, to the use of the spreader introduced by Farmer Miles.

Mr. MITCHELL replied on the discussion, and spoke in favour of the spreader.

The Consumption of Animals killed for Foot-and-mouth Disease.

Principal WALLEY read a paper on "The consumption of the viscera and other parts of the body of animals that are affected with Foot-and mouth Disease." After criticisng the evidence given in the recent action instituted in the Glasgow Sheriff Court, wherein the fleshers of Glasgow sought to hold the magistrates liable in damages for the destruction of heads, tongues, feet, and tripe, and in some cases of the hearts of animals which had been suffering from the disease, Principal Walley maintained that no single instance had been adduced of actual injury resulting to any person from eating the flesh of animals suffering from Foot-and-mouth Disease. He proceeded:—In Glasgow the tongue, head, heart, feet, stomach, and

intestines are all condemned; in Edinburgh I advised the inspector of the abattoir to condemn the feet, the stomach, and intestines whenever lesions were exhibited in them, and the tongue when markedly affected—when only slightly, the involved part to be removed with the knife, the healthy part to be passed; at Deptford, I am informed by Professor Duguid, neither the feet, tongue, nor tripe are condemned—they are allowed to macerate in a strong salt-brine for a few hours, and then treated in the usual way: at Liverpool and Birmingham, the tongue, feet, and stomachs are condemned. From the advice given by me to the inspector here, you will see that I approve of the confiscation of the tongue in marked cases, and of the feet and tripe when affected. In reference to the latter, we find, practically, that gastro-intestinal lesions are not common, they are only seen in cases where the disease has been suppressed, or in those of a very severe character; consequently I advised that the stomach and intestines be destroyed when lesions exist, but I hold that the destruction of the head or the heart is wanton waste, and if the head and the heart, why not the liver and the kidneys—organs of much greater vascularity, and in the case of the latter, important emunctories? Why, indeed, should not the whole carcase be condemned, seeing that the blood circulates everywhere? One medical witness said *that if he had his own way he would condemn the carcase in all cases.* I fancy he is a bolder man in the witness-box than elsewhere, and certainly if he carried his opinions to such an extremity he would be laying himself open to the charge of wilfully destroying a large amount of good and wholesome animal food; and if such opinions were universally acted upon when Foot-and-mouth Disease existed extensively throughout the kingdom, we should require to go farther than America for a sufficiency of animal food for the population of this country. Let us see how far there can be any probability of danger arising from the consumption of the different organs mentioned. We may dismiss the head and the heart with the remark that removing the tongue (and with it the glands intimately connected with it), these parts being purely muscular in their character, and consequently standing in the same position as the carcase generally, they cannot be separated from it. It is acknowledged by all pathologists that no virus with which we are acquainted can withstand the effects of prolonged and excessive heat, especially moist heat, as in boiling. In order that it be properly cooked, the tongue of an ox requires to be boiled for a period of several hours at least; and in the vast majority of cases, this organ is subjected to the action of salt, or salt and saltpetre, for some days before being used, and not unfrequently dried and smoked. After it is boiled, the whole of the mucous membrane is stripped off. The stomachs in most places are first of all cleansed thoroughly from extraneous matter; they are then subjected to the action of hot water for a period sufficiently prolonged to enable the dressers to remove the epithelium and the superficial mucosa—a matter of some minutes' exposure to water above the boiling point; they are then thoroughly scraped, and afterwards allowed to macerate for some time in cold water, and in some districts maceration alone is not trusted to, but the organs are exposed to the action of a strong mixture of lime and water; in all cases before tripe is fit for consumption it requires to be boiled for at least four or five hours. The intestines of cattle, so far as I know, are never used for human food directly; they are only employed as vehicles or envelopes in the manufacture of polonies and such like articles, and before being so used they are subjected to a complex process of exposure to lime, or lime and salt, with maceration until the mucous membrane is effectually destroyed by the process of decomposition. The feet are subjected to much the same process as the tripe, and every cook knows that before they can be utilized as food they require to be

boiled for many hours. So that I hold that in all these cases the probability of deleterious matter of any kind preserving its nocuous properties is not merely a remote one, it is more than chimerical. Seeing, then, that the lesions in ordinary cases are merely superficial lesions, that no proof of an altered blood crasis exists in the blood itself or in the muscular tissues, that the organs in question are subjected to processes which preclude the possibility of any minute organisms retaining even the semblance of vitality before being used as human food, we can arrive at one rational conclusion, viz., that the wholesale destruction of them when unaffected is a wilful waste of animal food of highly nutritious quality; more especially since it has been shown that even uncooked milk and flesh, contaminated with some of the most virulent organic poisons, may be consumed by animals and man with impunity, providing no breach of surface exists in the alimentary mucous membrane—a remote contingency, to say the least of it.

Discussion having been invited,

Mr. POTTIE, Paisley, said there should be an understanding in the profession as to diseases in animals that were really hurtful to human beings who consumed the flesh. He was very much struck with the evidence given in the Glasgow case by medical gentlemen, who, he held, could not form a proper opinion as to disease in the lower animals. He found them very ignorant of these matters, and it would be impracticable to follow out the opinions they gave. Foot-and-mouth Disease had existed from time immemorial, and the carcases of animals suffering from that pest had been eaten without in a single case any bad results following. When it was efficiently cooked, all the diseased germs were destroyed.

Principal WILLIAMS said that if they were to proceed on the basis that cooking destroyed the virus of the diseased product of Foot-and-mouth Disease and Pleuro-pneumonia, then they simply went on the broad principle that, no matter what the diseased condition of the animal might be at the time of death, the cooking would make it fit for human food. They must either take that position or else condemn all the diseased portions of the animal. He did not know a veterinary surgeon who would assert that the lungs of such an animal, no matter how slightly diseased, could be eaten with impunity. He had no doubt the lungs of animals suffering from Pleuro had been eaten without any deleterious effects; but he thought they should condemn all portions of animals suspected of being diseased. If they held the opinions enunciated that day, they were directly supporting the sale of diseased meat, for a butcher did not tell his customers that he had bought diseased animals at a reduced price, but he sold the meat at the same price that he obtained for the flesh of healthy animals. They ought, he thought, to set their faces strongly against the sale, for human food, not only of the tongues of diseased animals, but of all parts of the carcase which might be suspected to contain the germs of disease. Anthrax, one of the most fatal diseases that attacked the lower animals, had been eaten over and over again after being cooked, and without any contagion, but he held they were not justified in recommending as fit for human food the flesh of any animal that had died from that disease.

Mr. CAMERON, Berwick-on-Tweed, thought they should not kill animals at all when suffering from Foot-and-mouth Disease. The application of carbolic acid was sufficient to effect the object in view.

Professor BAIRD said if they were to be killed and sold as human food, they should be ticketed as having been slaughtered for that disease; and he would ask Mr. Pottie if, going into a butcher's shop and seeing a carcase ticketed as that of an animal killed for Foot-and-mouth Disease, he would purchase that flesh at the same price and as readily as he would sound meat?

Mr. POTTIE : Quite as readily—(laughter).

Professor BAIRD—Well, I would not. My plan of dealing with the disease would be to separate the affected animals from those free of disease, and allow them to recover before slaughtering them.

Mr. POTTIE said diseased flesh was being eaten every day, the best of the sheep that came into the market having diseased livers ; while braxy mutton had been eaten from time immemorial. He defied them to produce a single instance where bad results had followed the eating of animals slaughtered for Foot-and-mouth Disease.

Professor BAIRD : Why kill the animals for the disease if they will recover in a few days?

Mr. POTTIE : Because the disease is infectious, and people are naturally anxious to have the animals out of the way to prevent the disease spreading. I believe animals suffering slightly from Foot-and-mouth Disease are sold every day at as high a price as other beasts ; and I have myself partaken of a diseased carcase, and never felt the least injured by it.

Mr. CUNNINGHAM said braxy was generally eaten in this country up in the hills, and the air there enabled them to digest anything—(laughter). He himself would not eat a piece of a diseased carcase, and he did not think it right that he should have to pay for it.

Principal WALLEY, in reply, protested against the tone that had been imparted to the discussion. He brought the question forward as a scientific one, and he also most strongly protested against the assumption that he supported the sale of diseased animals. He only asked if there was anything to prove that human beings suffered from using the flesh of animals suffering from Foot-and-mouth Disease, and he said there was not. Further, assuming that such portions of the carcase were used as food, there was no proof whatever that they would do harm after they had been subjected to the process of cooking. He also stated that butchers did not, as a rule, purchase animals suffering from Foot-and mouth Disease at a much lower rate than they paid for healthy animals ; and if they did it was usually sold as second-class meat. If a butcher ticketed a carcase as that of an animal killed through being affected with Foot-and-mouth Disease, nobody would buy it. It was a case of "where ignorance is bliss, 'tis folly to be wise." He did not support butchers in selling diseased meat ; he merely asked the question—Have you any proof that such things as those he had alluded to can do any harm? and he said there was none.

Votes of thanks were given to Mr. Mitchell and Principal Walley for their papers, and the meeting separated. R. RUTHERFORD, *Secretary.*

WEST OF SCOTLAND VETERINARY MEDICAL ASSOCIATION.

A MEETING of this society was held in the Veterinary College, Glasgow, on Tuesday, September 18th. Present : Mr. Pottie, in the chair ; Prof. McCall ; Messrs. Anderson, Mitchell, Kerr, Constable, Dickson, Peddie, Lindsay, Jarvie, Brownlie, Wyper, Blue, Weir (Airdrie), Pollock, Frew, Tweedley, McLay, Sinclair (Cork), and the Secretary.

After some remarks from the Chairman and Messrs. Anderson and Mitchell touching the state of the society and the conduct of the late Secretary, the members proceeded to nominate and elect office-bearers for the ensuing year, with the following result:—

President—Mr. T. Campbell, Kirkcudbright ; Vice-Presidents—Prof. McCall, Messrs. Anderson, jun., and Archibald Robinson, Greenock ; Treasurer and Secretary—Mr. James Macqueen.

Mr. Anderson proposed, and Prof. McCall seconded, "That the names of the late Treasurer (Mr. J. P. Prentice) and Secretary (Mr. G. Hill) be

erased from the roll of members of the Society, and a vote of censure on their conduct inserted in the minutes." Carried unanimously.

The Chairman then submitted for discussion the subject of "Pink-Eye," in which a number of members took part. J. MACQUEEN, *Secretary.*

PROCEEDINGS OF THE FIRST GENERAL MEETING OF THE NATIONAL VETERINARY ASSOCIATION.

(*Continued from page* 215.)

Segregation, as carried out in infected places, is often rendered nugatory, or its value materially diminished, by the supineness shown by local authorities, or those acting under their instructions. In the great majority of instances, when an outbreak of Pleuro-pneumonia is reported, the veterinary surgeon visits the infected place, in order that the regulations may be put in force, and does not return again until summoned by the owner, or until the period of isolation expires; the result of this proceeding is that harassing regulations have frequently to be enforced for an indefinite period, and the infected herd is a standing danger to all in its immediate neighbourhood. The fault in these cases does not usually lie with the Veterinary Inspector; it has its origin in the parsimonious notions and shortsightedness of those who employ him. Where segregation alone is trusted to, to prevent the spread of Pleuro-pneumonia, the visits of the Veterinary Inspector should not be made at longer intervals than one week, and every animal in which symptoms of the disease exist should be removed for immediate slaughter, and suspected animals should be isolated.

I may here say, that in my opinion, the appointment of non-professional men as inspectors is much to be condemned, and should at once cease.

Inoculation, it is thought by some, would, if universally adopted, be the most effectual method of preventing Pleuro-pneumonia.

Valuable as this operation is in arresting the spread of the disease in localized centres, where animals are kept only for a limited period—say twelve or eighteen months—it could scarcely be applied to epizoöties of the disease, and certainly could not be more than moderately successful, unless it were made compulsory, not only in infected but in healthy herds—a system which would practically mean keeping the disease about for an indefinite period, and the fact must never be lost sight of that the inoculation fever circumscribes, and sometimes masks, the lesions of an intercurrent Pleuro-pneumonia, and that such an animal on recovery remains as an effectual disseminator of the virus of the disease.

Slaughter, not only of the affected but of every member of the herd, is, in my opinion, the only weapon that should be employed in the battle with Pleuro-pneumonia. It has, over and over again, succeeded in arresting the disease in the north of Scotland and other places, and its value has recently been, and is now being proved in the Netherlands, where every other known method of prevention has been tried and has been found wanting. With slaughter, thorough disinfection should be carried out, not the washy measures that are usually adopted, but radical and sweeping measures, such as the destruction by fire, or otherwise, of all litter, fodder, and manure, and of all wood-work: or scraping the latter or burning its surface with heated irons, subsequently painting it thoroughly with gas-tar (a disinfectant paint superior to all others), over which a layer of whitewash can be placed if its odour and colour are objectionable. Walls should be scraped and gas-tarred; floors thoroughly washed with boiling water and covered with a layer of quick or gas-lime, and mangers and troughs cleansed with hot alkaline wash.

In whitewash as a disinfectant I have no faith, except its use when hot can be guaranteed. Bi-sulphide of lime solution is infinitely superior.

(2) *Foot-and-mauth Disease.*—The orders and regulations of the Privy Council applied to this disease, elaborate though they are, are deficient in the same respect as are those which are applicable to Pleuro-pneumonia, viz., that an inspector has no power to slaughter (even the diseased animals) a herd of cattle when it makes its appearance among them. Consequently, the disease is allowed to gain a footing, and to spread in spite of everything and everybody. I am quite aware that in some instances the disease has been arrested by isolation simply, as was exemplified in the outbreak in Berwickshire in 1882, with the suppression of which I had a little to do: but such an energetic and intelligent chief-constable as Mr. List is not to be met with in every county, neither are surrounding circumstances always so favourable to the measures adopted as in this particular case. Slaughter, and that as speedily as practicable after the discovery of the disease, is the only means of suppressing the affection in isolated attacks, as was evident in the summer of 1882, in our dealing with it in Edinburgh; but I should hesitate to advise its adoption when the malady has spread over a wide district. I cannot myself see the logic of slaughter and compensation in the case of Pleuro-pneumonia while the former is not enforced, and the latter is withheld in our dealing with Foot-and-mouth Disease.

In dealing with this disease, power should be given to local authorities to declare infected areas, or to adopt such other measures as under the special circumstances of each case seems desirable.

(3) *Sheep Scab.*—I do not see any reason to make any extended remarks in reference to the prevention and suppression of this affection, as the Privy Council orders are effectual for the purpose of dealing with it in the case of flocks, but woefully deficient—in the same way as in the case of Pleuro-pneumonia and Foot-and-mouth Disease—in the case of sheep exposed for public sale.

(4) *Swine Fever.*—I have not had sufficient practical experience of the working of the orders issued under the Act in reference to this disease to be enabled to give an opinion of their merits, but I should consider, if properly carried out, they should be successful in arresting its spread.

(5) *Glanders and Farcy.*—On the whole, the provisions of the Act, if properly applied, are sufficient here, but where horse-owners are determined to thwart them, and local authorities are indifferent, they are very inefficient. As yet I have not failed to check the spread of the disease in every instance in which my advice has been followed, and where the powers given to me by the Act have enabled me to deal summarily with it; but in such places as London—hot-beds of the disease—nothing should be left to chance. Every stable should be licensed, and placed under the charge of a veterinary inspector, whose duty it should be to make periodical inspections, and where the disease exists, to visit the stables at least once a week, carefully examine every animal, isolate those suspected, and slaughter all actually diseased; at the same time carrying out, thoroughly, disinfectant measures and closing public water-troughs. I cannot myself see why compensation should not be given to horse-owners for the slaughter of glandered horses, equally as much as it is given to stock-owners for the slaughter of cattle suffering from Pleuro-pneumonia, or of pigs with Swine Fever.

The diseases above alluded to are all taken cognizance of by, and are embraced in, the orders issued under the Act; but it is a remarkable fact that other maladies equally deadly in their nature, and far more intimately affecting the direct well-being of the community, are, so far as the adoption of preventative or suppressive measures are concerned, entirely ignored by the Legislature, certain powers to deal with one only being given to the magistrates.

The diseases to which I allude are Rabies, Tuberculosis, and Anthrax, and, to a less extent, to Distomatosis.

I have said that certain powers of dealing with one of these diseases—viz., Rabies—are given to magistrates by the Municipal Act. Where these powers are properly employed they are effectual, as was proved by the ready way in which the disease was stamped out in Edinburgh in 1881; but I hold that the suppression of such a dire malady should be undertaken by the Privy Council, and that all legislative measures relating to it should be compulsory and of universal application.

In Tuberculosis we have a disease which, owing to its insidious nature, is even more dangerous to our race than Rabies. Why is it allowed to run its course unchecked, decimating our best herds, bringing to a premature close the lives of many of our most valuable cattle, and constituting, as it does, a perpetual danger to the lives of our children and to the welfare of our nation? It is, I conceive, the province of such an Association as the National Veterinary to take cognizance of such a question as this, and to impress upon the Legislature the paramount necessity that exists for the adoption of some stringent suppressive measures relative to the disease itself.

The remarks made in reference to Tuberculosis apply equally to Anthrax, except in so far, perhaps, as it is less prevalent, and not so insidious in its nature, though, in one sense, more malignant.

The remarks I have to make on sanitary matters apply, in particular, to the supply of milk and flesh-meat to our teeming population, and, consequently, to dairies, slaughter-houses, and dead-meat markets.

While dairies in towns and cities are compulsorily licensed and registered, no definite rules are laid down in reference to construction, flooring, drainage, ventilation, lighting, cleansing, water-supply, air-space, etc., or such rules are very irregularly applied; and whereas in some cases corporations insist upon proper attention being paid to such matters; in others, occupiers are allowed to keep their cow-sheds in any condition they please. In addition to the strict enforcement of sanitary regulations, every cow-shed in which animals are confined for milking purposes should be periodically—say every three or six months—inspected by a veterinary surgeon, and every cow should be examined with the object of detecting the existence of any diathetic affection, such as Tubercle, or any disease of the udder and uterus; and whenever such disease is detected, power should be given to the inspector to remove the affected animal to a sanatorium for further observation, or to an abattoir for slaughter. If, in the latter case, it were ultimately found on autopsy that no disease existed of a nature likely to render the milk harmful, compensation should be given to the owner of the cow. The adoption of such a system as this is rendered the more necessary owing to the fact that little reliance can be placed in the statements of dairymen, that the milk (often of considerable quantity) of unhealthy cows is not sold, and the difficulties lying in the way of proving its use are too great to be overcome by ordinary legislation.

In the matter of meat supply, while certain provisions are made for the inspection of flesh markets, and for the seizure of unwholesome flesh, diseased animals may be exposed for sale without let or hindrance. Sheep in an advanced stage of Rot, Louping-ill, or Sturdy; cattle in the last stage of Tuberculosis, Rot, and other diseases, are exposed for sale in open markets by hundreds every year, and inspectors have no power to prohibit such sales, or to seize animals when so exposed. Is this right? I am most certainly of opinion that any animal exposed in an open market or sale-yard, which gives evidence of the existence in its system of important organic disease, should be seized and removed to an abattoir for slaughter; and, according to the conditions revealed on autopsy, the carcase destroyed, or passed for human food.

In order further to prevent the unrestricted sale of diseased animals, all private slaughter-houses should be abolished, as the great majority of such animals are bought by low butchers, and removed quietly to some out-of-the-way place, or to a private slaughter-house, and there slaughtered—the carcases subsequently being conveyed surreptitiously to some sausage or prepared-meat manufactory for use in the preparation of polonies, etc.

Not only should great precautions be taken in reference to the inspection of meat at abattoirs, very stringent measures should also be enforced in reference to horse-slaughtering establishments, as I am quite sure that many of the products of slaughtered horses are used in the preparation of human food, more especially blood and intestines, in the manufacture of black puddings. Were these materials always obtained from healthy horses, the matter would not be of so much consequence.

In reference to the system of inspection of meat at present in use, I am of opinion that it should be placed on a more satisfactory basis, and in order to do this, definite conclusions should be arrived at, by a committee of scientific men competent to deal with the matter, as to what constitutes unwholesome and unsaleable meat.

The conflict of opinion on this subject, so often witnessed between professional men—doctors being pitted against veterinary surgeons, and not infrequently butchers against both—is very lamentable, and for the good of the public should not be allowed to exist.

The great questions requiring to be settled are: What conditions are to be taken as evidence of unwholesome flesh? is mere flaccidity, discoloration, decoloration, friability, or abnormal moisture to be held as sufficient to warrant the condemnation of a carcase, when no evidence exists as to the presence of disease in any of the internal organs?

In all cases, where it is possible to do so, the viscera of animals slaughtered under suspicious circumstances should be retained until the inspector has had an opportunity of examining them, and if any doubts exist in his mind as to the nature of any disease that may be presented, and its effects upon the nutrition of the flesh, he should be empowered to consult a veterinary surgeon, whose opinion might be further supported by the Medical Officer of Health, and from the decision of such experts there should be no appeal allowed.

Meat inspectors, as a rule, receive no special training for their office—they know nothing of the influence of disease upon the nutrition of muscle; they are utterly ignorant of the use of the microscope, and may be held as being quite innocent of a knowledge of even the elements of histology. Not only should inspectors be properly trained for their duties, but they should be submitted to a searching examination before they are placed in the important position of guardians of the public health.

Professor ROBERTSON, in opening the discussion on the second major subject, said:—"Mr. President and gentlemen, In looking over our programme for this meeting, I am favourably struck by the fact that we appear to have chosen subjects of a practical nature, rather than those which are novel. The matter which we are about to discuss is one of daily increasing importance, varying according to the stand-point taken, and the amount of information possessed by the individual. By some it is looked at from a medical point of view; but with the great majority its bearing upon the resources of the country is the chief reason for their attention being given to it. I need not try to impress upon you, gentlemen, the necessity for State interference in the regulation of our traffic in live stock, of that we are all aware. I will confine my observations to one or two points. Professor Walley has drawn our attention, first of all, to the origin of State interference in the matter of cattle diseases; he has then adverted to the results which have followed; and lastly, has thrown out some suggestions. As to its origin

we are all aware that this State control is of comparatively recent date, and that, notwithstanding the changes it has undergone, it bears upon its face the impress of those conditions which called it into existence. The majority of us can recollect the time of the Cattle Plague, in 1865, the wonderful amount of disturbance connected with it, the great loss it occasioned, and the spasmodic efforts made to stay its progress. Animal plagues we had suffered from previously, but it was only when this "rinderpest" attacked the agricultural resources of the country that the Legislature took the matter in hand. There is a good deal that is humiliating about that period. The country knew little about the disease, and the knowledge which a few individuals possessed was rejected with scorn by the rest of the community. I think, sir, that you are aware that, with our usual self-sufficiency, we ignored all that had previously been done in the way of preventive medicine and sanitary police, and for this had to suffer severely, losing about £10,000,000. To such an extent was this refusal to be instructed carried, that I find it was stated in the House of Commons, upon high authority, that the Cattle Plague must be met by vaccination. There is no doubt that the necessity for State interference has been brought home to the minds of all thinking men, both by the loss occasioned by these diseases in a monetary point of view, and from the close relation which some of them seem to bear to those in the human being. But with many, fault-finding seems to be a part of their nature, and anything of an official character is especially looked upon as wrong. Now, as professional men, let us view these matters with calm and dispassionate eyes. The Cattle Plague was by the measures adopted got rid of, and at one time it seemed as if Pleuro-pneumonia would share the same fate. In certain districts of the country it rarely appears, and when it does, is of very short duration; but in others it seems to have an abiding existence, and from thence is distributed over the country. With other maladies our experience is as satisfactory, although ever and anon, under certain conditions, they show us that they have lost none of their power to destroy. There are several reasons to assign for the fact that the Act has not been more successful even than it has. One is, the absence in those who legislate for us of a true appreciation of the nature of the diseases they are dealing with. They seem to think that they are produced by indigenous causes. Now, Sir, the result of this opinion is a half-hearted action, a liability to be turned aside by the breath of public opinion, and by the exigencies of party spirit. Another reason why the Act has not produced the results it would otherwise have done, is a laxity in carrying out the regulations. Why demand more power when you do not use that which you possess? There is wanted a proper distribution of the work to be done, and a fitting selection of the officers to perform it. Another question is, whether the Act is comprehensive enough, or whether certain other maladies should be included in it? I think they should. There are many diseases of an epizoötic character which, although not transmissible to man, are yet productive of a vast amount of loss in the way of the animal wealth of the country. We may here instance that form of epizootic fever which has been so prevalent within the last three months. Another subject, very serious in its results, is that of "parasitism," and it would seem as if this might be dealt with by State laws. There are difficulties in the way, but I think they might be met. The Act has not had a fair trial, nor, I fear, will this be accorded to it while the local authorities are left with so much power in their hands. It is wonderful to what an extent self-interest will blind men, and cause them to imperil whole districts. I have very strong opinions upon this point, and think that the application and carrying out of the legislative enactments ought not to be left under the discretionary power of any local authority. The direction of affairs ought to emanate from one

central power, and no part of the country should be exempt from the operation of its laws. With regard to the officers who carry out the regulations, I think that those who hold the principal positions, at all events, should be professional experts, only answerable to a certain extent to the local authority, and receiving their remuneration direct from the central body. The officers chosen ought to be placed in such a position as to be under as little inducement as possible to wink at the non-carrying out of these repressive measures. I think that there should be a direct prohibition upon the importation of stock from any country where the Privy Council is not satisfied as to its being free from disease. I know that this will seem a hardship to some, but it will be more than compensated for by the benefits obtained. If this is not carried out, I agree with my friend that we should have compulsory slaughter of all animals that have been in contact with affected animals. With regard to "Glanders," I do not know whether you are aware that in London last year eleven hundred horses are put down in the knackers' books as having died from this disease. It seems to me that, with respect to this malady, we are using certain measures to do away with it, and at the same time allowing other conditions which are favourable to its extension. Then, with reference to the inspection of the food supply of the country, we require a special training for this for which, I am afraid, we are not prepared.

Professor WILLIAMS: I think that the usefulness of the Act is impeded by the manner in which it is carried out. I have had great experience as an inspector, and I think I am justified in saying that the great drawback in the administration of the Act is the interested motives of those gentlemen forming the local authorities. These gentlemen are much concerned in the cattle trade, and when a proposal is made which affects them, they put their foot down upon it, and the Act cannot thus be carried out efficiently. I think that the Act cannot be carried out properly, unless the laws emanate from a central authority, to which alone the officers entrusted with the duties in connection with it should be responsible. I think that the future working of the Act should be under the guidance of the veterinary profession. I quite agree that Anthrax is a contagious disease, but by inoculation only. I do not see why the country should be called upon to pay compensation for the slaughter of animals that have died of Anthrax, which is a malady only local in its effects, and I do not understand what benefits would be derived from including it in the Act. As to Tuberculosis, I think it should be included, not only because it would cover a few mistakes we are apt to make, but because of the effect the disease has upon the public health generally. Independently of the contagiousness of the malady, there is no doubt that it is transmissible by inoculation from animal to animal, and from man to man. In Scotland we lately had an outbreak of Foot-and-mouth Disease, but owing to the regulations being carried out effectually, it scarcely spread at all. As to including parasitical diseases in the Act, I think this would require very careful consideration.

Mr. DUDGEON: With regard to the disease called "Pink-Eye," there has been a great deal of discussion in the North of England with reference to including it in the Contagious Diseases (Animals) Act; but the difficulties in the way are, I fear, so great as to prevent this being done. I think the Act in itself is very good, but that it is not properly carried out. It is the local option in it which produces failure. One local authority frames different regulations to another. I know one case where fifty-six days expired before the local authority sent a police-sergeant to examine the cattle and give a certificate. This Act will never produce the good results of which it is capable until its administration is taken up by the central authority. I scarcely agree with Professor Walley when he advocates such wholesale de-

struction of the litter which is very valuable upon the land. Our local authorities say that veterinary inspectors are unnecessary in cases of Foot-and-mouth Disease, and so the matter is left in the hands of policemen, simply to save expense. Professor Robertson alluded to the proposition that the Privy Council should preclude the importation of animals from countries where there might be a doubt as to whether these maladies were prevalent. I think so much restriction upon trade is hardly practicable. Last year there were in round numbers about a million and a half of animals imported into this country, out of which eight hundred and fifty were reported as diseased by the inspectors. Some two or three hundred of the cases reported were those of "Sheep Scab," so that the number of infectious cases was small. The population of the large towns would be very dissatisfied if the live-meat trade were abolished.

Mr. HUNTING: I am inclined to think that the Act might be widened a little, although, practically, it is comprehensive enough. The reason why the Act is not carried out as it might be is, that the local authorities are often careless and ignorant. At the same time I do not agree with centralization, because it causes such opposition from the local authorities that it is difficult to carry out the provisions of the Act. For instance, in the case of the clause for compensation—this has to be paid by the local authority, and a man does not care to pay this if the cattle have been killed by some one else's orders. After all, I think that the veterinary profession should come in for its full share of the blame, although every year it is correcting its ideas upon the subject (Glanders). When a veterinary surgeon advises his clients to treat Farcy until it becomes noticed, and then gets him to send the horses to the knacker after dark, I say that he has no right to blame the local authorities. Prof. Walley pointed out one great defect, namely, the ability of an owner to move his animals. I doubt very much whether you could induce the Government to shut up the markets and half ruin the owners of stock, even to benefit the British public. With regard to Farcy and Glanders, the value of the Act depends nearly entirely upon the local authorities. Professor Walley speaks of London as the hotbed of disease, but it must be remembered that London far exceeds in size either Edinburgh or Manchester. At one time there was a great deal of under hand work with regard to horse-slaughterers reporting to the Veterinary Department, but they were threatened with the deprivation of their licences, and the result was that Glanders seemed to be increasing simply because the cases were more faithfully reported. During the past year there has been a great reduction in the number. It has been suggested that there should be a constant inspection of a stable where the disease has broken out. I do not think this would avail much, because the period of incubation is so long. I do not believe that Glanders is spread by means of public water-troughs. In the majority of cases, you can distinctly trace its origin. There ought to be a regulation to prevent a man from selling his horses when he knows they are diseased, as is frequently done now. My opinion is that *a case of Farcy is never cured, and it should be made illegal to treat Farcy.* The laws as to the destruction of horses suffering from Glanders are, I think, not strict enough. The animals are allowed to live too long after the attack. I believe, with a more stringent oversight by inspectors and horse-slaughterers, Glanders could be stamped out. I think that the Act is a fair one in giving compensation in cases of Pleuro-pneumonia, and not of Glanders. There is a strong temptation to illegally sell a diseased bullock, but a dead horse is of very little value.

Mr. GRAY: I wish to call your attention to the efficacy of inoculation in Pleuro-pneumonia. I was sorry to hear Professor Walley say that pole-axing was a remedy for this disease. After the evidence we have upon the

value of inoculation, it is disheartening to think of a valuable herd of short-horns being killed in the manner suggested. Some time ago I adopted inoculation for the malady, and only lost about five per cent. Perhaps it might be a remedy for other complaints. I do not think it is necessary to include Anthrax in the Contagious Diseases (Animals) Act.

Dr. FLEMING (President): I think that the great cause of failure in the operation of the Act, is the want of centralization. If this country were invaded, we should not trust to the local authorities to repel the invader. It is well known that, from mercenary and other motives, the local authorities are often unwilling to carry the Act into operation. There cannot be the least doubt, that if the central authority would insist upon the proper carrying out of the Act, we should soon have a diminution, if not a suppression, of the diseases included in it. In one county you may see the local authorities doing their utmost to carry out the regulations properly; in the adjoining county you find them quite indifferent to the advice of the veterinary surgeon, or even employing men who are utterly incompetent to give them counsel. With regard to the list of diseases included in the Act, I think it is incomplete. There is, at least, one disease which it should embrace, viz., "Rabies." In continental countries this malady is brought under the operation of the law. This disease is always present amongst us, appearing from time to time, in certain parts of the country, in an epizoötic form. Anthrax is not present amongst us, as it is in more southern countries, where it is a terrible infliction; and in France, Germany, and Italy it is included amongst the Contagious Diseases; but I think there is no necessity for doing so here. With respect to Pleuro-pneumonia, I think that it might be stamped out if the Act were carried into effect properly. It is a most difficult disease to eradicate, but in Holland, where it was at one time an even worse scourge than it has been here, it has been so successfully dealt with, by passing and carrying out severe legislative enactments, that there appears now to be only six cases in a little village on the frontier. I think that the employment of incompetent men, as inspectors, has much to do with the want of success in the operation of the Acts. It is also a matter of absolute necessity that the inspectors should be above local influences. I think that the country should be mapped out into districts, and a veterinary surgeon placed in each, to see that the enactments are carried out properly. In my work on "Sanitary Police," I sketched out a plan, which, if adopted, would tend very largely to the extinction of these maladies.

Mr. WILSON: I should like to say that I have had a very large district to inspect, and that my local authority has always given me all the power I required. I have never found that my professional avocation has interfered with my duties as inspector. I fully agree with Professor Walley's paper in most points. I do not think it is necessary to include Anthrax and Rabies in the Act. I may just allude to a case which came under my observation about five years ago. Ten or twelve cattle died of "Splenic Fever," and were buried in a careless manner in a field. That field was planted with turnips which were drawn into the yard and given to healthy cattle, and the result was a fresh outbreak of the fever. I think that the diseases I have just mentioned might be included in the Act for purposes of inspection, but not for compulsory slaughter or compensation. I do not agree with the compulsory slaughter of animals affected with Foot-and-mouth Disease. During the last three years I have had outbreaks of the disease in my district. I have isolated the animals, and have prevented the spread of the malady from one farm to another.

The PRESIDENT: Gentlemen, I am sorry to say that I must leave you, but I cannot do so without expressing the great interest I have felt in the proceedings of to-day. It is a source of extreme satisfaction to me to

have been your first President, and to have received so much support from you.

Professor WALLEY: I propose a vote of thanks to Mr. Fleming. We owe him a deep debt of gratitude for presiding here to-day in the manner he has.

The vote of thanks having been unanimously accorded, Mr. Fleming briefly returned thanks, and said that as he was obliged to leave them, he would propose that Professor Robertson take the chair. The meeting cordially supported this proposition, and that gentleman occupied the chair.

Mr. CAMERON: It appears to me that a paper upon a large subject like this might have been divided into two or three parts. I hold that the details of the Act are very incomplete. I think that centralization would not be effective, but the very opposite. I believe in a medium between the two. In my opinion there is as much fault to be found with the central authority as with the local authority. I think that the railways are a great cause of the spread of diseases. The means of cleansing horse and cattle boxes are very inadequate and disinfectants are not brought enough into use. I think that if the authorities were to expend some of their funds in carbolic acid instead of so much upon printing and publishing, it would be better.

Mr. MALCOLM: I am inspector for four local authorities in Ireland, and I think that isolation as now carried out will not stamp out the disease.

Professor MCCALL: A great deal has been said about inoculation for Pleuro-pneumonia, but from my own experience I am not inclined to recommend it. I think if the local authorities would act upon all the power they have in their hands the complaint would be stamped out.

Professor WALLEY: I have had a good deal to do with the suppression of Pleuro-pneumonia by inoculation and other methods. I am sorry that Mr. Fleming has had to vacate the chair, because the statement he made with reference to the disease being stamped out in Holland by stringent repressive measures was misleading, as a recent number of the VETERINARY JOURNAL will show. It is by the adoption of slaughter that the good results have been brought about, and we can say the same with respect to the north or even the south of Scotland. I like inoculation to a certain extent, but the chances are that an affected beast is left, and this animal becomes a means of spreading the disease. I do not think that "Pink-eye" and diseases of that kind should be included in the Act. I quite agree with Mr. Hunting that Farcy cannot be cured. With regard to Foot-and-Mouth Disease, if I had been given the power to shut the market gates of Edinburgh, the disease would not have spread over Scotland. I think we ought to advise farmers to breed their own cattle. Then, again, we slaughter thousands of calves every year, and the result is that we are obliged to go somewhere else for our store stock. I think we should insist that when a farmer makes a purchase of stock he should keep the fresh animals apart from the others for some time. Gentlemen, I thank you very heartily for the manner in which you have received my paper.

Professor ROBERTSON then said it was necessary that some definite result of the discussion should be shown, and after a considerable amount of deliberation the following propositions were put to the meeting and carried unanimously:—(1) "That with the exception of the slaughter of animals for isolated outbreaks of Foot-and-mouth Disease, this meeting concurs with the general views expressed in Professor Walley's paper." (2) "That in the opinion of the meeting it would be wise for the working of the Contagious Diseases (Animals) Act if the Central Body (Privy Council) were to take the whole of the responsibility on themselves, and not leave it to the local authorities."

Professor PRITCHARD then proposed a vote of thanks to Professor Robertson for so ably carrying out the duties of chairman.

This being unanimously agreed to, Professor ROBERTSON briefly responded, and the meeting broke up.

The following subjects were brought before the members of the Association during the meeting :—

1. The rules of the Association as suggested by the Provisional Committee.

The PRESIDENT said he was satisfied with the rules as they stood ; but he would ask those present to express their opinions with regard to them.

Mr. GREAVES proposed that the rules be confirmed.

Prof. WALLEY seconded this, and remarked that, if there were any alterations necessary, they could be considered at some future meeting.

2. The question of when and where the next general meeting of the Association should be held.

Mr. GREAVES was of opinion that the general meetings of the National Veterinary Association should be bi-annually, and suggested that the next meeting should be held at Manchester under the auspices of the Lancashire Veterinary Medical Association.

Professor WALLEY and other members were also in favour of the meeting being held in Manchester.

Mr. LUPTON thought that it should be held in London, as being more convenient and central.

Birmingham, or some other Midland town, was also mentioned as being a suitable place.

The PRESIDENT said that Manchester was the home of the first Veterinary Medical Society in this country. It was a good centre for a large number of the members, who would be sure to attend, and a good meeting would thus be secured. Moreover, one of the principal features of the Association was that its general meeting should be held in differents parts of the country ; therefore he should support the motion.

A resolution was then moved by Mr. GREAVES, seconded by Mr. WOODS, and carried, *That the next general meeting of the National Veterinary Association be held in Manchester.*

Some discussion then arose as to when the meeting should be held. Some considered that the meetings should only be held bi-annually, others thought they ought to take place annually.

Ultimately, Prof. WALLEY proposed, and Mr. LUPTON seconded, *That the next general meeting should be held next year,* which was agreed to by the meeting.

3. The election of officers for the ensuing year :—

(*a*) *President.*—Mr. BANHAM proposed that Mr. Thomas Greaves, of Manchester, be elected President. He said Mr. Greaves had taken a great interest in the formation of the Association, and he was sure it would be beneficial to the Association if he would officiate. Mr. FREEMAN seconded this, and Mr. Greaves was duly elected.

Mr. GREAVES briefly responded, thanking the members present for the honour they had shown him by electing him for their next President. It was quite unexpected, and he would endeavour to carry out the duties to the best of his ability.

(*b*) *Vice-Presidents.*—Mr. C. Hunting and Mr. J. H. Simcocks, proposed by Mr. BANHAM ; Mr. H. Olver, proposed by Mr. PENBERTHY ; Mr. Wm. Woods, proposed by Mr. ALEX. LAWSON ; Mr. John Lawson, proposed by Dr. GEO. FLEMING ; Mr. Augustus Taylor, proposed by Mr. Woods.

(*c*) *Council.*—Dr. FLEMING proposed that the President and Vice-Presidents elect the six Members of Council to hold office during the next year under Rule XXXVI. (6).

(*d*) *Treasurer.*—Dr. FLEMING proposed Mr. Wragg be re-elected.

(*e*) *General Secretary.*—Dr. FLEMING proposed Mr. Banham be re-elected.

(*f*) *Provisional Committee.*—It was proposed that the formation of this committee (under Rule LIII.) be entrusted to the President and Vice-Presidents.

These were all agreed to by the meeting.

LIST OF MEMBERS OF THE NATIONAL VETERINARY ASSOCIATION.

Those marked (1) have served as President.
" " (2) " " as Vice-Presidents.
" " (3) " " on the Council.
" " (4) " " as Treasurer.
" " (5) " " as General Secretary.
" " (6) " " on Provisional Committee.
" " (7) " " as Local Secretary.
" " (8) " written papers for discussion.
(F) signifies Fellow of the Royal Coll. Vet. Surgeons.

N. Almond, Chipping Ongar.
J. W. Anderton (F), Skipton-in-Craven.
W. Awde, Stockton-on-Tees.
(3) J. M. Axe, Doncaster.
(6) J. W. Axe, Professor, R.V.C.
(3) Alex. Bain, Liverpool.
(5. 6) Geo. A. Banham (F), Cambridge.
(6) J. D. Barford, Southampton.
W. F. Barrett, New Cross, S.E.
H. T. Batt (F), London.
Thos. Batt, London.
(6) E. E. Batt, The Brown Institution.
F. Blakeway (F), Stourbridge.
Geo. Bland, Alfreton.
H. Blunt, Lutterworth.
L. J. Blenkinsop, London.
W. H. Bloye, Plymouth.
Wm. Bower, East Rudham.
(3) H. K. Bradshaw, Portrush.
Thos. Briggs (F), Bury.
(3. 6) Alf. Broad (F), London.
Arthur Broad, "
J. Broad, "
(3) T. D. Broad (F), Bath.
(3) W. Broughton (F), Leeds.
(3) G. T. Brown, Professor, R.V.C.
J. H. Brown, Wanstead.
T. Burrell, London.
John Cameron, Berwick.
(3) W. J. Carless, Lincoln.
(3) W. Carless, Stafford.
J. S. Carter (F), Bradford.
H. J. Cartwright (F), Wolverhampton.
(6) A. R. Charles, London.
E. T. Cheesman (F), A.V.D.
T. G. Chesterman, London.
Jos. Coe, Stoke-upon-Trent.
A. C. Cope, Veterinary Department, Privy Council.
(3) J. J. Collins (F), P.V.S., A.V.D.
(6. 8) J. H. Cox, A.V.D.
(6) J. Roalfe Cox (F), London.
(3) C. Cunningham, Slateford.
Herbert Davis, Blackheath.
J. Donald, Wigton.
D. Dudgeon, Sunderland.
W. Duguid (F), Veterinary Department, Privy Council.
H. Dyer, Leatherhead.
H. Edgar, (6) W. Alston Edgar, } Dartford.
R. C. Edwards, Chester.
C. W. Elam, Liverpool.
(3) G. Elphick, Newcastle-on-Tyne.
J. E. Elphick, Ash Sandwich.
(6) F. Farrance, Eastbourne.
Ed. Faulkner, Manchester.
Hugh Ferguson, Warrington.
John H. Ferguson, Leeds.
F. Ferris (F), A.V.D.
(2) Sir F. Fitzwygram, Bart. (F)
(1. 3. 6) Geo. Fleming (F), LL.D., P.V.S., A.V.D.
Jas. Freeman (F), Hull.
Thos. A. Frost, Hounslow.
D. Fulton, Mullingar.
W. F. Garside, Professor, Cirencester.
(6) J. Gibbs, Bromley.
Geo. Goodacre, Crowle.
Wright Graves, Histon, Cambs.
Alex. Gray, Prof. Royal (Dick) Vet. College.
G. Gray, Romford.
(2) Thos. Greaves (F), Manchester.

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(3) J. D. Gregory, Bideford.
T. P. Gudgin (F), I.V.S., A.V.D.
John Hammond, Bale.
(6) W. J. Hancock, London.
Matthew Harpley (F), A.V.D.
(3) J. P. Heath, Exeter.
Frederick Hewson, Royston.
H. Hills, Cambridge.
O. J. Hills (F), Leamington.
H. T. Hogben, Folkestone.
E. A. Hollingham, Red Hill.
S. E. Holmans, S. G. Holmans, } Lee Green, London.
Tedbar Hopkins (F), Manchester.
T. A. Huband, Cheltenham,
(3) H. Hunter, Newcastle.
Chas. Hunting (F), C. S. Hunting, } South Hetton Fence Houses.
(6) W. Hunting (F), London.
J. S. Hurndall, Liverpool.
F. R. Ingersoll, Lewisham.
J. C. James, Thornbury.
H. Kidd, Hungerford.
J. Lambert (F), I.V.S., A.V.D.
(2) T. D. Lambert (F), Dublin.
(3) Alex. Lawson, John Lawson, } Manchester.
Joseph Leather, (3) Wm. Leather (F), } Liverpool.
Wm. Lee, High Wycombe.
G. A. Lepper (F), H. S. Lepper, } Aylesbury.
Thos. H. Lewis, Prof. New Vet. Coll.
Frederick Low, Norwich.
J. I. Lupton (F), Richmond.
J. Mackinder (F), Peterborough.
(3) John Malcolm, Enniscorthy.
F. F. Marshall, A.V.D.
(3. 6) J. B. Martin, Rochester.
I. Matthews, (F), A.V.D.
(3) J. McCall (F), Principal, Glasgow Veterinary College.
(6) D. McGill, London.
E. Mellett, E. J. Mellett, } Henley-on-Thames.
Chas. W. Moir, Cardiff.
(3) J. W. T. Moore (F), Birkenhead.
T. Moore, London.
W. J. Mulvey, Durham.
E. Nettleship, F.R.C.S., London.
Geo. A. Oliver (F), A.V.D.
H. Olver (F), Tamworth.
T. Olver, Truro.
Alf. Over, Rugby.
(3) J. D. Overed, Blofield.
J. G. Parr, Leicester.
G. T. Patterson, London.
(5. 6. 7) J. Penberthy, Lecturer, R.V.C.
T. S. Price, London.
(2. 6) Wm. Pritchard, London.
(6) W. W. Reekie, London.
W. Roach, Exeter.
(3) Wm. Robertson (F), Principal, R.V.C.
M. M. Rock, Chislehurst.
P. A. Rock, Chelsfield.
J. A. Rostron (F), A.V.D.
(6) J. Rowe, London.
(3) B. H. Russell (F), Grantham.
(2. 3) R. Rutherford, Edinburgh.
F. G. Samson, Mitcham.
A. H. Santy (F), Norwich.
S. R. Sartin, A.V.D.
(6) H. K. Shaw, London.
E. S. Shave, Lecturer, R.V.C.
(6) Chas. Sheather (F), London.
W. Shipley, Great Yarmouth.
(3) T. H. Simcocks, Drogheda.
(6) H. C. Simpson, Windsor.
S. Slocock, Hounslow.
W. W. Smart, Newcastle-on-Tyne.
Benjamin Smith, Barnsley.
(6) W. A. South, London.
(3) J. J. Sperring (F), Dublin.
E. Stanley (F), Warwick.
C. Stephenson (F), Newcastle-on-Tyne.
R. Stephenson, Longton.
R. A. Stock (F), Lewis.
F. W. Tayler, Cheltenham.
Rowland Tayler, Colchester.
W. A. Tayler (F), Manchester.
(3) W. H. Thomas, Plymouth.
(3) L. C. Tipper, Birmingham.
(3) R. C. Trigger, Newcastle-under-Lyne.
Sidney Villar, Harrow-on-the-Hill.
J. P. S. Walker, Oxford.
(3. 8) Thos. Walley, Principal, Royal (Dick) Veterinary College.
Page Wallis, Cambridge.
(6) W. B. Walters (F), Professor, A.V.S.
Geo. Waters, Cambridge.
Wm. Whittle (F), Manchester.
(3) Wm. Williams (F), Principal, New Veterinary College.
Wm. Wilson, Berkhampstead.
(3) J. B. Wolstenholme, Manchester.
(3. 6) Joseph Woodger, London.
Wm. Woods (F), Wigan.
(3 4. 6) Frank Wragg, London.

Jurisprudence.

GLANDERS AND HORSE-DEALING.

AT the Sudbury County Court recently, before Mr. J. T. Adby, judge, the case of Christopher Jackson *v.* Frederick Mayhew was concluded.—This case was part heard at last court, when the plaintiff, the landlord of the White Lion Inn, Colchester, claimed £10 damages from the defendant, a dealer, of Sudbury, on the sale of a mare, it being alleged that the sale was effected by wilful misrepresentation. The question really turned upon whether the animal was suffering from Glanders at the time it was sold (the 16th of last May). At the previous hearing the plaintiff stated that defendant told him the animal was sound; but Mr. Cowan, veterinary surgeon, of Colchester, stated most emphatically that the animal was suffering at the time from Chronic Glanders. On the other hand, defendant produced Mr. Arnold, veterinary surgeon, of London, who said the animal was only affected with nasal gleet.—His Honour, in giving judgment, made some very strong remarks on horse-dealing cases and the general conduct of horse-dealers. In all these cases, he said, he must assume that everybody who had anything to do with the disposal of horses invariably tried to cheat his neighbour. That opinion was the result of the considerable experience he had had in these cases, and he always received the evidence with great caution and suspicion, and had to look to surrounding circumstances. He held that although the defendant at the time of the sale gave no warranty, yet from attendant circumstances he must infer that he represented that the animal was not only quiet but really sound. His Honour firmly believed that the horse was suffering from Glanders, and that defendant knew at the time he sold it that it was not well, and therefore unsound. There seemed something bordering on fraud in the attendant circumstances and in the conduct of the defendant, and taking the whole evidence, he must give a verdict for the plaintiff for £8, the sum at which the horse was sold.—On the application of Mr. Jones, the costs of five witnesses were allowed for one day, and the costs of plaintiff and two witnesses for two days.

Obituary.

INTELLIGENCE has been received of the death on Sept. 11th, from Cholera, of F. C. BOULTER, Army Veterinary Department. Mr. Boulter volunteered for service in Egypt, and had only been at Alexandria a few days when he died. His funeral took place with full military honours, and was attended by the General commanding the garrison and all the officers. He graduated in 1864, and entered the army soon afterwards.

We have been informed of the death of another member of the profession from Cholera—that of Mr. J. M. CLAYWORTH, M.R.C.V.S,—who succumbed to the disease at Cairo, Egypt, in September. He graduated in 1861.

The following death has been reported to the Registrar: H. T. HODGKINSON, Rochdale, graduated April, 1877.

Army Veterinary Department.

Gazette, August 28th.

First-Class Veterinary Surgeon W. B. Walters, to be Inspecting Veterinary Surgeon.

INDIA OFFICE.—*Gazette*, August 31st

Her Majesty has been pleased to direct that the following officer be allowed to retire from the service:—Veterinary Surgeon G. Western.

Gazette, September 11th.

Veterinary Surgeon, First Class, Charles Percivall retires on retired pay.

To be Veterinary Surgeons on Probation :—Arthur Frederic Appleton, Alexander Henry Waddel, Edwin Hills Hazleton, Layton John Blenkinsop.

Notes and News.

CATTLE PLAGUE IN RUSSIA.—The extent of cattle plague (Rinderpest) in Russia may be gathered from statistics compiled by the Minister of the Interior. According to these, 1,010,962 head of cattle have perished during the last four years in European Russia alone.

RINDERPEST IN JAVA.—It is stated that Dr. Van der Heyden has, at the invitation of the Netherlands-India authorities, experimented in Java on animals affected with Rinderpest by means of the intravascular injection of iodine. The injection has, according to Dr. Van der Heyden, the effect of completely annihilating the bacillus of the disease.

ANTHRAX IN RUSSIA.—The *Saratovski Listock* says that a short time ago the Siberian plague broke out among the horses of one of the villages of Saratov, and thirty horses die every day. The same disease has now broken out among the cattle, and rages so severely that in some of the villages not one beast remains alive. No means are taken to prevent the disease from spreading.

RUSSIA'S HORSE RESERVE.—Austria-Hungary is said to possess 3,569,000 horses, Germany 3,352,000, France 3,000,000, Great Britain 2,790,000, and Italy 657,000 ; while in the Kirghiz steppes alone Russia possesses 4,000,000 riding horses. The excellent qualities of the Kirghiz horse have led to a proposal to use it for cavalry remounts. The provincial studs (says the *Pall Mall Gazette*), especially those of the Don, are in decadence ; the price of horses is consequently rising, and the difficulty of procuring remounts is continually increasing. Sooner or later Russia must fall back on the studs of the steppes. The Kirghiz horses constitute a precious and abundant reserve. Most of these horses are small, intelligent, docile, of great speed, indefatigable, and very temperate, qualities which make them suitable for military service. The best are those belonging to the steppes of Orenburg and Turkestan ; but only half of them are available for regular cavalry, the others being too small. It is also doubtful whether these horses, used to a dry, hot climate and the herbage of the steppes, could bear the damp which prevails in the greater part of Western Russia.

AN UNUSUAL CASE.—In a letter to the *Live Stock Journal* on the action of chloroform on dogs, Mr. J. W. C. Selle relates the following curious case :—"Quain," the bull-pup, the property of F. Slinger, Esq., F.C.S., of York, and the winner of the second prize at the Royal Dog Show this year at York, when quite a pup, seized its mother's chain (a strong one, with spring fastener attached), and getting it down its throat, began to swallow, until it had ten and a half inches down. At first we tried to pull it up by main force, but evidently the open clasp had got fixed in something—probably the windpipe ; and the more we pulled, the more the pup swallowed the chain. A medical man and our veterinary surgeon arriving, under their instructions we administered half an ounce of chloroform, and then with a pair of long forceps tried to reach the end of the chain, but without avail, although the administration of chloroform was a perfect and quite harmless success. A smith was sent for, and the chain was filed through at the

dog's mouth, he immediately swallowing the ten and a half inches of the chain. Ten drops of croton oil in linseed oil were at once given, and the dose repeated after three hours' interval, the dog being fed on slop food. But no chain passed until the eighth day, when dry biscuits had been substituted for the slops, and then the bull-pup passed the chain, nicely wrapped round with hay (which it must have been eating, and every link compactly placed, to make it as small as possible to pass, and the piece of chain as bright as if it had undergone a scouring with emery-paper. To conclude, and to show that in this instance chloroform had no ill effect, this pup grew rapidly into a fine bull-dog, larger than the other pups born with him, and was able to gain the second prize at the York Show. The correctness of this account can be testified by Dr. Bossier, of Pocklington; J. F. Day, Esq., consulting veterinary surgeon; W. Slinger, Esq.; Mr. William Driffield, the keeper; as well as your humble servant.

ANIMAL INTELLIGENCE.—Adopting the terse language of Shylock, we may ask, Hath a dog reason? And falling into a more lengthy style, we may inquire, Is its reason at all comparable to that of the human being? We think both these questions must be answered in the affirmative. Those who differ from us will certainly admit that the possession by man of a language of symbols must have an enormous influence in increasing the power of his intellectual faculties. So much, indeed, must this be the case that what is really only a difference of degree is yet so stupendous that an intellect, the product of the employment for ages of word signs, might be thought to be an altogether new and original faculty. We are inclined to assert, however, that almost the sole essential difference between the intellect of the dog and that of the man may be traced to the above cause. A dog can reason, but not by using symbols. It employs the mental picture of an object, the olfactory perception of an agent, the auditory impression of a sounding body for the terms of its premises. But clumsy as these may seem, yet the mind of the animal successfully grapples with them. The dog argues from the ideas of concrete things, although incapable of abstraction and of the formation of a conception. Devoid of generalisations, it deals with particulars; but it does reason; it substitutes one idea for another; it weighs and estimates at their true value the successive mental images which present themselves to itself. Every one knows the tenacious memory of the dog, not only for what it has seen, but for what it has smelt and heard. The olfactory sense in many species is truly marvellous, and its mental grasp or memory of the same is remarkable in an equal degree. No division can scientifically be drawn between the memory of a landscape by a dog and the recollection of a region by a man. Moreover, the dog is not simply a mechanism, the result of hereditary action. The individual can learn new things—nay, even execute complex mental feats, for itself. The following instance, which forcibly illustrates the power of the reasoning of the dog, came under our personal notice. A gentleman last season bought a middle-aged blue pointer, which with his good qualities as a "wide ranger" and "staunch pointer" combined the faculty of retrieving partridges. When the snipe season commenced in October, the dog took no notice whatever of the "long-bills," but looked upon them as vermin and drove them away. After being out about six times snipe-shooting, finding that his master shot these birds, the dog stood at each snipe, and when killed, dropped it at the sportsman's feet. The instance is certainly remarkable. Such a faculty of ready apprehension and creditable performance of a difficult mental task (for it must be remembered that he had his hereditary influences to overcome) would have been hailed with delight had it been manifested by a child who had not the knowledge of spoken language.

Correspondence, etc.

THE DEGREE OF LL.D.

SIR,—I was hoping that Mr. Macgillivray would have responded to your invitation appended to his letter in the August issue of the Journal, to furnish you with information as to when, where, and for what, the honorary degree of LL.D. was (as he asserts) conferred upon the late Professor Strangeways, and what his contributions to veterinary science were. As he evidently declines to do so, will you allow me to state, in contradiction to the assertion of Mr. Macgillivray, that the editorial remark—to the effect that Mr. Fleming, having had this degree conferred upon him, was the first member of the profession to receive it, and that this is the first time that a university has acknowleged the claims of veterinary science to the highest honour the senate can confer—is absolutely accurate. I have made inquiry of every university in this country which bestows this degree, and for at least the last fifty years no one of the name of Strangeways appears in their lists of Doctors of Laws. I was a student in the Clyde Street School when Strangeways was a teacher there, and though it was sometimes mentioned that he was an LL.D., there was no proof of it, and it was surmised that if there was any foundation for the report, it was due to his having become possessed of some "bogus" American honour.

As for his scientific work, Mr. Macgillivray cannot give any evidence of it, beyond, perhaps, one brief paper on the discovery of a supplementary muscle in the eye of the ass. As for what he did for veterinary science, there is no record ; and as for what he did for us students in the way of tuition, the less said the better for his memory.

Your statement is, therefore, quite correct, that Mr. Fleming is the first member of the veterinary profession in this country (or any other country) to receive the *real* (not *bogus*) degree of LL.D. for what he has done to advance human and veterinary medicine.—Yours truly,

September 12th. "AN EDINBURGH STUDENT OF 1868."

CRUELTY TO ANIMALS: UNSOLING A HORSE.

SIR,—I am induced to offer one or two remarks on the above subject, because from Mr. Walters' letter in last month's journal it would almost appear, as a result of the magisterial investigation, that he (Mr. Walters) was not only acquitted, but that no condemnation of his practice followed. He seems to have entirely overlooked the fact that, although not convicted, he was very far from being acquitted ; and that he escaped conviction *not* because the magistrates thought him guiltless in the matter, but because Mr. Greaves expressed the opinion that unsoling a horse might prove beneficial for sidebone, and that the operation was less painful than that of firing ; and also because numerous witnesses came and swore that in many cases it had absolutely cured ringbones which, as a result of the operation, had entirely disappeared.

Witnesses also swore that *tearing off the sole* from the animal in question (which was cast with ropes tied tightly round the newly-fired coronets) caused very little pain—apparently none.

To my thinking, the decision of the magistrates, with which, having heard the whole of the case, I thoroughly agreed, was *a sufficient condemnation of the practice complained of;* as they refused to allow Mr. Walters any costs, to which he would have been entitled if acquitted, and expressed the opinion that, having regard to the *painful nature* of the operation, if performed it should only be when the patient was under the influence of an anæsthetic.

I am deeply sorry that Mr. Walters should have thrown so much personal animus against the three veterinary surgeons for the prosecution into his letter. Personally, I may entirely disclaim any but the most kindly feeling towards Mr. Walters, of whom I know comparatively little; and I may here state that when this case was laid before me by the prosecution, and I had expressed the decided opinion that to unsole a horse to cure sidebones or ringbones was an act of gratuitous cruelty, I had not an idea who it was that the case referred to, and never for a moment imagined that it could apply to a member of the Royal College of Veterinary Surgeons. I naturally thought it the work of a blacksmith, and was deeply pained to find that I should be called upon to substantiate that opinion against a member of my own profession. I have no doubt that the professional gentlemen engaged with me were equally free from any personal feeling in the matter.—I am, etc.,

Newcastle, Staffordshire, *September.* ROBT. C. TRIGGER.

UNINTENTIONAL CRUELTY?

DEAR SIR,—I venture to hope that the profession will unanimously acquit Mr. Walters of the charge of cruelty to animals, as it is clear that he performed the operation under the impression that he was relieving pain, and restoring the animal to usefulness.

As to the operation itself, it is quite impossible that it can cure sidebones and ringbones. I have never seen the operation performed for such a purpose, or ever even heard of its being performed until my attention was drawn to the present case. But it must be remembered that veterinary science has made rapid strides during the last quarter of a century, and because an old practitioner like our brother professional has not quite been able to keep pace with it we must not denounce him as ignorant or inhumane; perhaps on other points he may be in advance of us.

His theory is undoubtedly far-fetched, as it is not in accordance with the laws of practical surgery that any treatment to the sole can cause bony deposits, such as ringbone and sidebone, to become absorbed, or in any way relieved. As a matter of course, it should be treated in the same way as an exostosis on any other part, *i.e.*, locally, with fomentations, poultices, cold applications, and stimulants. Perfect rest is very essential, and this may have been the means of misleading our friend, as the horse after having undergone the operation referred to is naturally unable to use the limb for a considerable period, thereby causing the irritation and inflammation to subside and the exostosis to become absorbed.

Viewed in this light Mr. Walters is *right* when he says he has restored scores of other animals to usefulness and soundness, but he is *wrong* as to the cause of the cure.—Believe me, dear sir, yours truly,

Athlone, *September 5th.* JOHN FERRIS, V.S. 1st Class, A.V.D.

SERVING ON JURIES.

SIR,—Will you please inform me if a qualified veterinary surgeon is exempt from acting on a jury, as my name is entered on the list?—I remain, sir, yours respectfully,

Cerne Abbas, *September 1st.* C. NORTH.

[It is unfortunately the fact that a qualified veterinary surgeon is not exempted from serving on juries. When the Veterinary Surgeons Bill was before the House of Lords, Lord Aberdare, at the pressing request of Mr. Fleming, moved to have them exempted, but on going to a division there was a majority (among them being the present Lord Chancellor) against the motion. Another attempt must be made.]

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A MONSTROSITY.

SIR,—In reference to what is described at page 228 of last month's Journal, as a unique case of "*lusus naturæ*" in a calf, I may say that I met with a similar case in August of last year. The cow was of the Devon breed. The head of the monstrosity, when removed, was found to contain two brains, and there were two pairs of nostrils, but the mouth was single, and there were only two eyes and two ears present. As in the case mentioned, the trunks and legs were well developed. Much difficulty was experienced in effecting delivery, embryotomy being performed, but the cow made a good recovery. The two cases perhaps differ in the fact of the head of that here described being in part double, as also was the neck, although this was but slightly indicated externally,—I remain, sir, yours faithfully,

FRED HARVEY,

St. Columb, Cornwall. *Student, Royal Veterinary College.*

HEROIC TREATMENT.

DEAR SIR,—A curious episode occurred in one of H. M. regiments in India, a few months since.

An elephant, attached to the commissariat depôt, was suffering from constipation of the bowels, and no veterinary surgeon being with the troop, the officer in charge was puzzled as to what treatment to adopt. An enema was suggested; the next thing was how to administer it.

No other way out of the difficulty presenting itself, a detachment was ordered out with the fire engine, and an enormous quantity of water was injected into the suffering animal.

The elephant died; but whether from the disease or the remedy adopted will never be known to science, as no *post-mortem* examination was made.

The above is a fact, and can be duly authenticated.

ROBERT J. DAWSON, V.S.

A GRIEVANCE.

SIR,—Through the medium of the VETERINARY JOURNAL, I would ask, "Has any alteration been made in the manner of signing the diplomas of new members of the profession?" In March last I qualified; how am I to obtain names for the spaces left vacant on my diploma? Three days I remained in London; going to Red Lion Square for a note to the examiners, asking them to sign my diploma (what a farce!); am here waiting until some half-dozen arrived to have their names put on the *one* letter. Then we had to find those we sought as best we could, in all quarters of London; and, finally, I left without some of the chief signatures, and *yet* I require some.

I venture to say, sir, this state of affairs is neither creditable to the Council of the College, nor just to the aggrieved ones, some of whom can ill afford the time and expense involved.

And how do the Council act when appealed to? Simply, they take no notice. To them I directed a letter, by Professor Robertson's advice, to which I have received no reply, and perceive no mention of the matter in the records of their meetings.

Trusting this subject *will* receive the attention it deserves, I remain, sir, yours truly,

Liverpool, *August 28th*, 1883. E. WHITLEY BAKER.

[A new arrangement came into operation last July, by which the omission complained of will be avoided for the future. It has for a long time been a grievance that only a portion of those who should sign the diplomas did so. All the examiners will, under the new arrangement, sign them.]

IMPOSITION.

SIR,—As you publish a list from time to time of new members of the profession, I beg to enclose the advertisement of one who has escaped your notice, though not that of the sanitary authorities. The advertiser was a shoeing-smith in my forge not many months ago, and from the boldness of his advertising has apparently no fear of the Veterinary Surgeons Act before his eyes. It is not to this, however, that I wish especially to call attention, but to the growing practice of persons pretending to treat the diseases of dogs placing the letters M.R.S.P.C.A. after their names. I find a great many dog-owners suppose such an array of capitals to mean membership of some learned body, while others take it simply that the Royal Society for the Prevention of Cruelty to Animals has granted certificates to the advertisers. I do not know how far the Society is aware of the prostitution of its good name to the service of impostors, but it certainly should be discountenanced by veterinary surgeons ; and for this reason I beg your influence in preventing a practice calculated to neutralise, in however small a degree, the benefit anticipated by the Veterinary Surgeons Act, of which most of us are proud to regard you as the father. "A VETERINARY SURGEON."

J. STRAND, M.R.S.P.C.A.
(Four years Practical Assistant to Mr. H. LEENEY, M.R.C.V.S.),
CANINE SURGEON AND CHIROPODIST,
DEALER IN DOGS, etc.,
4, LITTLE WESTERN STREET,
WESTERN ROAD, HOVE.

John Strand, 4, Little Western Street, was summoned for allowing his premises to become foul and keeping dogs in a filthy state. Notice was given him on August 20th to abate the nuisance when there were twelve dogs in the back yard in a dirty state. Since then all but one had been removed, but the yard was still in a filthy state. Defendant was fined 40s. and costs, and ordered to abate the nuisance within twenty-four hours.

[On and after January 1st, 1884, the penal section of the Veterinary Surgeons Act comes into operation, and cases like the above are those for which it was specially framed.]

A PATENT HORSE-SHOE.

DEAR SIR,—Will you kindly allow me space for a few particulars regarding the Improved Horse-Shoe, for which I have recently obtained a patent. It consists of a thin plate, provided with six, eight, or ten cogs (according to the purpose for which it is required), or blunt, wedge-shaped projections, formed in one piece with it, of equal size, situated at equal or approximately equal distances apart, radiating from the centre of the base of the hoof, and extending across the entire width of the web. From practical experience I find it possesses the following special advantages :—

1. Owing to the arrangement of the cogs, it presents an equal bearing surface ; consequently, the natural position of the navicular, pastern, and fetlock joints is not interfered with, as is the case with the calkin or cog-shoe used to prevent slipping, the evils arising from the use of which are too well known to your readers for me to dilate upon here.

2. From the position and formation of the cogs, a firm foothold is obtained on any surface.

3. The total thickness of the web and cog does not exceed that of an ordi-

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nary shoe, therefore the frog is not prevented from coming in contact with the ground.

4. It is made lighter than a shoe of the ordinary pattern, and it requires only the same number of nails to attach it to the foot.

5. It may be used with advantage on all descriptions of ground, and for all kinds of work.

6. It wears better, and prevents slipping for a longer period than any other shoe that has been used for that purpose.

7. It economises the strength of the animal, as it enables it to travel with comfort and without slipping.

On examining the feet of one of my horses which has been wearing my improved shoe for the past six months, I observed that the crust had greatly improved, as the nailing on of the shoes had not in any way injured it, as frequently occurs with an ordinary shoe; this is evidently due to the fact, that with my shoe the heads of the nails are not brought to bear on the ground to any extent.—Believe me, dear sir, yours truly,

Athlone, Ireland. JOHN FERRIS, F.R.C.V.S., A.V.D.

Communications, Books, Journals, etc., Received.

COMMUNICATIONS have been received from R. Rutherford, Edinburgh; "An Edinburgh Student of 1868"; J. Ferris, A.V.D., Athlone; R. J. Dawson, London; W. R. Davis, Isle of Man; C. North, Cerne Abbas; F. Harvey, Cornwall; C. Cowie, Banff.; "A Veterinary Surgeon"; A. E. Queripel, A.V.D., India; R. C. Trigger, Newcastle-under-Lyme; J. A. Nunn, A.V.D., Punjab; Dr. Wehenkel, Brussels; Professor McQueen, Glasgow.

BOOKS AND PAMPHLETS: *Dr. J. Brümmer*, Der Dauer, Erkennung und Regelwidrigkeiten der Trachtigkeit; 'S Rijks Veeartsenijschool, Programma der Lessen; Annual Announcement of the Columbia Veterinary College; Tiende Jaarverslag van Het Parc Vaccinogène bij 'S Rijks, Veeartsenijschool te Utrecht, 1882; *Professors Thiernesse and Degive*, Inoculation Preventive de la Pleuropneumonie Contagieuse des Bêtes Bovines; *I. Leyder*, Les Animaux Domestiques a l'Exposition Nationale de 1880; *L. Brouwier*, La Phtisie Tuberculeuse dans ses Rapports avec la Boucherie; *C. W. Dulles, M.D.*, Remarks on Hydrophobia.

JOURNALS, ETC.: *Annales de Médecine Vétérinaire; Œsterreichische Vierteljahresschrift fur Wissenschaftliche Veterinärkunde; Journal de Médecine Vétérinaire; Archives Vétérinaire Wochenschrift für Thierheilkunde und Viehzucht; Quarterly Journal of Veterinary Science in India; L'Echo Vétérinaire; American Veterinary Review; La Presse Vétérinaire; Recueil de Méd. Vétérinaire; La Clinica Vétérinaria; Lancet; American Live Stock Journal; Deutsche Zeitschrift für Thiermedicin und Vergleichende Pathologie; Live Stock Journal; Revue Vétérinaire; Schmeide-Zeitung; Monatsschrift des Vereines der Thierärzte in Oesterreich; British Medical Journal; Mark Lane Express; United States Veterinary Journal.*

NEWSPAPERS: *Thanet Free Press; Hampshire Independent; Canadian Gazette.*

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith. We cannot undertake to return rejected communications.

A number of communications are held over until next month.